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New Orleans District

**CULTURAL RESOURCES SURVEY,
LAKE PONTCHARTRAIN WEST SHORE
HURRICANE PROTECTION PROJECT,
ST. JOHN AND ST. CHARLES PARISHES,
LOUISIANA**

Final Report

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EARTH SEARCH, INC.
P.O. Box 770336
New Orleans, LA 70177-0336

Prepared for
U.S. Army Corps of Engineers
New Orleans District
P.O. Box 60267
New Orleans, LA 70160-0267

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6. AUTHOR(S) **Aixa Wilson, Aaron Deter-Wolf, Benjamin D. Maygarden, and Mary Elizabeth Weed**

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**Earth Search, Inc.
P.O. Box 770336
New Orleans, LA 70177-0336**

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This report presents the results of the cultural resources investigations undertaken by Earth Search, Inc. (ESI) in support of the U.S. Army Corps of Engineers, New Orleans District (NODCOE) proposed Lake Pontchartrain West Shore Hurricane Protection Project District in portions of St. Charles and St. John the Baptist Parishes, Louisiana. Fieldwork consisted of a program of shovel testing and auger probing within the project right-of-way (ROW). The total area surveyed was approximately 33.6 ha (83 A). A circa 1920 Fairbanks Morse diesel engine was noted to the east of the St. John the Baptist Parish airport in Area B of the project area. The engine is not eligible or potentially eligible for nomination to the National Register of Historic Places (NRHP). No other cultural or architectural features were identified within or adjacent to the project corridor.

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CHAPTER 1 INTRODUCTION

Earth Search, Inc. (ESI), performed an intensive cultural resources survey of approximately 2.9 km (1.8 mi) of the Lake Pontchartrain West Shore Hurricane Protection Project proposed levee right-of-way (ROW). This survey was performed for the U.S. Army Corps of Engineers, New Orleans District (NODCOE) in portions of St. Charles and St. John the Baptist Parishes, Louisiana. Fieldwork was undertaken to locate and define any cultural resources that exist along the proposed ROW. Two areas, designated Areas A and B, were identified as high probability for the presence of cultural remains. In both survey areas, the footprint alignment closely followed a pre-existing levee and canal. As defined in the scope of work, the survey areas extended 46 m (150 ft) to the south and 76 m (250 ft) to the north of these features as defined in the scope of work.

As a result of the survey, no cultural resources were recorded in Area A. A Fairbanks Morse diesel engine (ca. 1920) was noted to the east of the St. John the Baptist Parish airport in Area B. The engine was photo-documented. It is not eligible or potentially eligible for nomination to the National Register of Historic Places (NRHP).

Project Area

The project area consists of an approximately 32 km (20 mi) long, 122 m (400 ft) wide corridor in St. Charles and St. John the Baptist Parishes, Louisiana. The project footprint roughly parallels the Mississippi River from Section 42, T11S R8E to Section 66, T11S R6E (Figure 1). The proposed levee will begin within the backswamp between Lake Pontchartrain and the Mississippi River and extend westward, bordering Interstate 10 (I10) and portions of US Hwy 61 (US61). Much of the proposed levee route follows existing canals and small field levees.

Areas A and B were designated high probability based on the intersection of natural waterways and their associated natural levees with the project area (Figure 1). Area A is a 1.4 km (0.9 mi) section of ROW extending through Sections 76, 77, 78, and 100, T11 R7E. Area B is a 1.4 km (0.9 mi) section of ROW within Section 57, T11 R6E. The total area surveyed for the project is approximately 33.6 ha (83 A).

Project Action

The NODCOE plans to construct a hurricane protection levee to protect the communities of LaPlace and Reserve and surrounding areas from storm surges associated with severe weather. The project will include constructing new levees and augmenting existing levees. The construction ROW for the levees will measure 400 ft (120 m) in width. The proposed levee construction will impact the backswamps and filled margins in the ROW.

Report Organization

Chapter 2 provides a discussion of the environmental setting of the project area. The prehistoric and historic occupations of the region are discussed in Chapters 3 and 4, respectively. Chapter 5 summarizes previous archeological investigations, identified sites, and historic standing structures in the vicinity of the project area. Chapter 6 describes the methodology and results of the survey. A summary and recommendations are presented in Chapter 7.

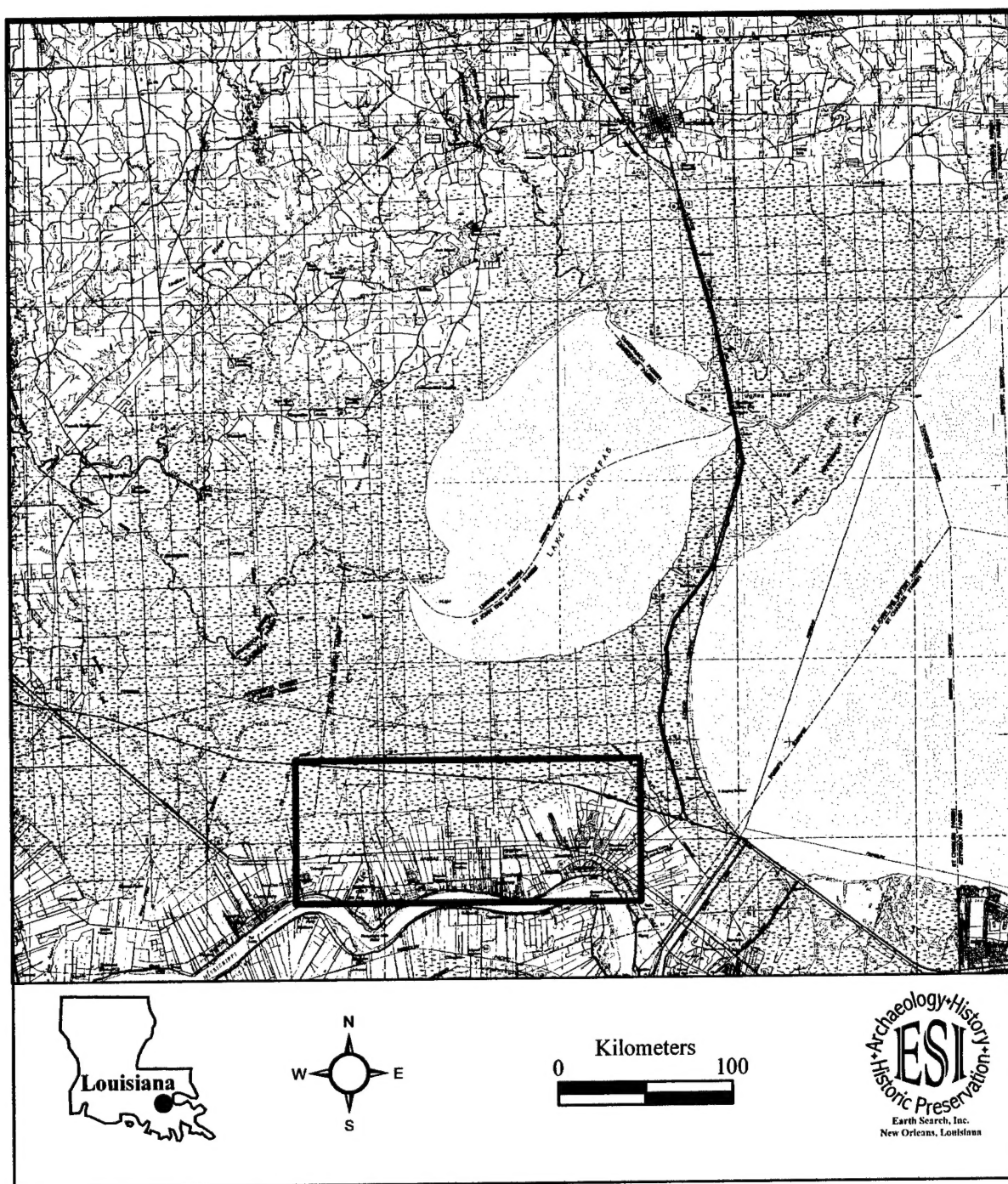


Figure 1. Excerpt from the USGS Pontchartrain, LA 1:100,000 quadrangle showing the location of the project area in red.

CHAPTER 2 ENVIRONMENTAL SETTING

Introduction

This chapter provides basic data concerning the natural landscape surrounding the project area. The development of the Mississippi River alluvial valley was dominated by a complex series of geologic events and dynamic fluvial activity. Repeated periods of fluvial entrenchment and deposition during the Pleistocene created the valley. Processes associated with this activity not only reworked the alluvial plain, but also reshaped the biological and depositional environments located within the valley. Due to the constantly changing nature of the alluvial valley, prehistoric inhabitants of the region employed settlement selection strategies to exploit the rich natural resources of the alluvial plain. Conversely, historic and modern inhabitants utilized artificial control structures (e.g. man-made levees) in an attempt to exploit more of the natural resources, while at the same time creating a "built environment" to cultivate domesticated commercial crops. The numerous environmental factors influencing the distribution of archeological deposits throughout the project area must be understood in order to interpret the archeological record and the depositional contexts in which artifacts are found. Therefore, this chapter identifies and briefly describes those factors that influenced the use of the project area by prehistoric and historic Americans and later altered the cultural deposits that they left behind.

Geomorphology of the Mississippi River Valley

During the Late Pleistocene Epoch (1.8 million-10,000 years B.P.), repeated entrenchment of the Mississippi River formed the Mississippi Alluvial Valley. Terraces along the tributaries of the Mississippi indicate that the River and its associated incised tributaries were established by at least the Early Pleistocene. The Mississippi River Alluvial Valley gradually widened over time, and in most areas is as wide as it has ever been (Autin et al. 1991).

During the Wisconsinian Stage (35,000-10,000 years B.P.), sea level fluctuated by tens of meters below modern. The lowest stand of sea level occurred between approximately 22,000 to 17,500 years B.P., when sea level dropped as low as 100 m (328.08 ft) below current mean sea level. This low stand of sea level caused the Mississippi River to entrench its valley at least as far north as the latitude of Baton Rouge. At this time, the floodplain consisted of extensive braidplains formed by braided streams carrying large quantities of glacial outwash (Saucier and Smith 1986; Schumm and Brakenridge 1987).

The portion of the Mississippi River south of the current project area has been an active channel for the last 4,700 years. During the end of the Pleistocene and into the early Holocene, the survey area was part of the ancient Louisiana coastal plain. Melting of the continental ice sheets resulted in a rise of sea level that flooded the survey area by 7,000 B.P. The area remained open gulf water until approximately 4,700 B.P., when the Mississippi River diverted its flow from the Teche delta complex into the St. Bernard delta complex. This shift caused the St. Bernard delta complex to rapidly prograde eastward into the Gulf of Mexico. It was at this time that the main channel of the Mississippi River south of the survey area was established.

The Holocene alluvial valley of the Mississippi River extends in a southerly direction more than 600 mi (960 km) from Cairo, Illinois to Head of Passes, Louisiana, where the river discharges sediment-laden waters into the Gulf of Mexico through multiple distributaries. The alluvial valley contains two distinctive depositional sedimentary environments: the alluvial flood plain and the deltaic plain. The Mississippi River deltaic plain forms the lower portion of the alluvial valley, beginning at approximately Donaldsonville, Louisiana and extending to the prograding birds-foot delta in the Gulf of Mexico (Russell 1936; Fisk 1944; Saucier 1974). An

east/west trending fault separates an area of uplift and erosion of the alluvial flood plain from the subsiding and downwarping deltaic plain (Autin et al. 1991). The physiography of the deltaic plain broadly consists of the following three types of features: elevated meander belt ridges and levees which form the framework of the deltaic plain, interdistributary bays consisting of forested swamps and coastal marsh, and reworked beach deposits (Russell 1936; Fisk 1944; Kolb and van Lopik 1958).

Specific Deposition Environments Within the Project Area

The Lake Pontchartrain West Shore Hurricane Protection Project runs along the boundary of two broadly defined geologic zones. These are the natural levees along the Mississippi River, and the backswamps north of the natural levees. In addition to the Mississippi River, another prominent stream course appears in the vicinity of the project area. The Mississippi Bayou flows into the project area north of Reserve, Louisiana. Distinct sedimentary processes resulting in recognizable depositional phases dominate each of these zones.

Natural Levees. During flood stage, floodwaters containing some bedload and considerable amounts of suspended load escape the banks of an active river channel and accumulate along the margin of the channel creating natural levees. When floodwaters uniformly overflow the banks of a channel, the spreading action of the water and the baffling effect of flood plain vegetation reduce floodwater velocity. Silt and sand suspended within these floodwaters quickly settle and accumulate along the margin of the river channel. Only the finer suspended clay is transported into the backswamp of the flood basin. The silt and sand accumulate incrementally with each flood to build low, wedged-shaped ridges, called "natural levees". These levees parallel the riverbanks and slowly taper away from the river (Galloway and Hobday 1983; Farrell 1989; Flores et al. 1985).

Through the project area, the edge of the natural levee lies from 3.1 to 4.0 km (1.9 to 2.4 mi) from the north bank of the Mississippi River near the town of Reserve. Towards the east of the project area, the edge of the natural levee lies as far as 6.5 to 7.1 km (4.0 to 4.3 mi) from the north bank, near the town of LaPlace. Adjacent to the Mississippi River, the natural levee is as high as 5 m (18 ft) above sea level. The natural levee gently drops in elevation to the adjacent backswamp. Where the natural levee and backswamp merge in the area of the proposed levee ROW, the elevation is less than 1.5 m (5 ft) above sea level.

Typically, natural levees consist of fine sandy loams, silts, silt loams, and silty clays laid down incrementally in thin lenses during periods of overbank flooding. These sediments are usually thickest and coarsest adjacent to the riverbank. As they move away from the river, the sediments are thin and decrease in grain size gradually until they interfinger with clay-like flood basin sediments. The sediments of older, relict natural levees of river channels typically consist of massive, often iron-stained, stiff to very stiff, mottled brown to grayish brown, fine sandy loams, silts, silt loams, and silty clays. In the case of younger, active natural river levees and major crevasse distributary channels, these sediments may exhibit internal bedding and sedimentary structures that reflect rapid deposition by multiple, shallow flow events. The natural levees of the smaller crevasse distributaries consist of stiff gray clay with a small percentage of silt and fine sand, and they contain abundant, sometimes oxidized plant roots (Galloway and Hobday 1983; Farrell 1989; Flores et al. 1985).

Except for the most immature examples, natural levees are subaerially exposed for long periods of time between the brief periods of overbank flooding. These periodic wetting and drying episodes result in natural levee sediments that are compacted, oxidized, highly leached, and bioturbated by pedogenic processes and weathering. Natural levees contain massive, buried weathering zones containing iron oxides, carbonate nodules, and iron oxide concretions (Fisk 1947; Galloway and Hobday 1983).

Eventually, a natural levee aggrades to a level above the bankfull stage of a river where it cannot be uniformly overflowed by floodwaters. Subsequent floodwaters escape the river and overflow the natural levee through local breaches called "crevasses". The flow of floodwaters is concentrated within crevasses, often causing them to further cut and widen into "crevasse channels". Typically, a crevasse channel cuts through a natural levee at right angles and is dry except during flood stage. During flood events, suspended load and some bed load are transported from the river, through the levee, and into the near-channel portion of the adjacent flood basin (Fisk 1947; Galloway and Hobday 1983; Farrell 1989).

As sediment-laden floodwaters exit a crevasse channel, they decrease in velocity and deposit their load of sand and silt as crevasse splay, a delta-like landform with a distinct triangular or elliptical plan and a radial distributary system composed of anastomosing or straight channels. During floods, crevasse splays often act as a delta by prograding into a flood basin filled with standing water. As flow velocity of the floodwater drops, crevasse splays are aggraded by the accumulation of suspended and bed loads upon its surface (Galloway and Hobday 1983; Farrell 1989; Flores et al. 1985).

In two locations along the proposed right-of-way, the natural levee features large crevasse splays, as mapped by McCulloh et al. (1997). Just west of Dutch Bayou, a large crevasse splay lies within Sections 13, 31, 32, and 60, T11S R6E. The crevasse is between 1.3 and 1.4 km (0.8 to 0.9 mi) wide and 4.0 km (2.4 mi) long. The proposed levee ROW crosses the northernmost tip of this crevasse splay within Section 32, T11S R6E. A second crevasse splay lies on the eastern edge of Laplace, Louisiana. The crevasse splay is between 4.5 and 5.0 km (2.7 to 3.0 mi) wide and extends as far as 6.5 km (4.0 mi) from the bank of the Mississippi River. It occupies the area between Section 64, T11S R7E and Section 43, T11S R8E. Prominent irregular ridges and channels characterize the surface of this crevasse splay. The eastern end of the proposed levee ROW, south of the I10-US51 interchange, lies entirely on the northern distal edge of the second crevasse splay (McCulloh et al. 1997). The natural levee and the crevasse splays along the Mississippi River represent the accumulation of the overbank sediments over the last 4,700 years (Frazier 1967; Britsch and Dunbar 1990).

Backswamp. The backswamp consists of low, flat areas periodically covered or saturated with water. These areas support a cover of woody vegetation both with and without shrub undergrowth. Coleman (1966) identified the following two types of backswamp: well-drained and poorly-drained. Well-drained swamps are characterized by both saturated and subaerially exposed land during large portions of the year. Inundation occurs primarily during periods of high flooding because of slightly higher elevations and efficient drainage channels. Therefore, reducing and oxidizing conditions alternate during the accumulation of sediments. Poorly-drained swamps are inundated more or less permanently by standing, often stagnant, water. The variations in the oxidizing and reducing conditions found within both types of backswamp impart a distinctive character to the sediments that define the sedimentary facies characteristic of each type of swamp. Low sedimentation rates and infrequent to frequent subaerial exposure, cause backswamp sediments to be preconsolidated by dewatering to create stiff, but highly fissured clayey deposits (Coleman 1966; Saucier 1974).

The sediments of the well-drained swamp consist of light gray to light yellowish brown and dark brown, organically poor clay with scattered silt lenses. Typically, these sediments are highly mixed by floriturbation and lack discernible stratification. Well-drained swamp deposits are typically highly fissured as a result of periodic desiccation. Faunal remains rarely occur in these swamp facies due to intense leaching and oxidation. Well-drained swamp sediments characteristically contain abundant nodules and small geodes of calcium carbonate (CaCO_3) and small nodules of iron oxides, while other diagenetic minerals are very rare (Coleman 1966; Krinitzsky and Smith 1969).

Poorly drained swamps consist of very organically rich, black to bluish gray clays with occasional laminations of silt, common laminations of compressed plant remains, and large fragments of wood. Often, thin beds of woody peat are intercalated within the clays. Faunal remains present within poorly drained swamp sediments consist primarily of pulmonate and freshwater gastropods. Diagenetic minerals found in poorly drained swamp sediments include pyrite (FeS_2) and vivianite ($\text{Fe}_3[\text{PO}_4]_2 \cdot 8\text{H}_2\text{O}$). Anaerobic microorganisms that thrive in the fully saturated environment remove oxygen from these sediments causing the reduction of iron and manganese into soluble forms creating bluish, greenish, and grayish sediments called "gleys" (Coleman 1966; Krinitzsky and Smith 1969).

Soils

Cockerham et al. (1973) and McDaniel (1987) mapped the soils in the current project area as belonging primarily to the Convent and Sharky series soils. On the natural levees, the soil associations are generally Convent complex (Cr) and Sharky clay (Sk), while the backswamp area exhibits both Convent and Barbary soils, frequently flooded (Cs) and Sharky association, frequently flooded (Sm).

The Convent complex soils consist of highly fertile, somewhat poorly drained soils at the highest local elevations. Convent complex soils have a dark grayish-brown surface layer consisting of friable silt loam up to 14 in (33 cm) thick. Beneath this surface layer, the soil consists of grayish-brown silt loam and very fine loam mottled with yellowish brown. Runoff from Convent complex soils is moderate, as is permeability. The soil is excellent for crop cultivation, as it contains high levels of potassium and phosphorous, low nitrogen, and is neutral to moderately alkaline.

Convent and Barbary soils are characterized as gently undulating along low parallel ridges and swales. The surface layer of Convent soil consists of dark-grayish brown silt loam up to 15 in (35 cm) thick. Underlying layers are highly stratified, with grayish-brown silt loam and very fine sandy loam. Barbary soil is very dark grayish brown and mucky, with underlying greenish-gray semifluid clay. These soils are of low permeability and frequently flooded, and therefore unsuited to crop cultivation.

Sharky clay soils are found on the lower elevations of the natural levees along the Mississippi. The surface layer of this soil is dark-gray clay up to 16 in (37 cm) thick, while the subsoil is gray clay with brown mottling. Sharky clay soil is highly fertile, with high levels of phosphorus and potassium, and low nitrogen content. During wet periods, the water table in this soil rises to within 10 in (23 cm).

Sharky association soils appear between the natural levee and the swamp. The surface layer of the soil consists of dark-gray clay, 6 in (14 cm) thick, with underlying dark-gray or gray clay with brownish mottles. While natural fertility is high, these soils have slow surface runoff and permeability, and are therefore unsuited for crops.

Climate

Following continual changes in the paleoenvironment over thousands of years, modern weather patterns were established between 2000 and 1000 B.C. in the southeastern United States (Bense 1994:24). The major modern plant and animal communities were in place soon after that time. The plant and animal resources available to the regional inhabitants probably did not differ significantly from those recorded by modern biologists and botanists.

All of Louisiana is located within an area of humid meso-thermal climate of the humid subtropical type generally characterizing the southeastern United States. Summers are hot and humid with prevailing winds from the Gulf of Mexico. From May through October, the average daily maximum temperature is 91°F (33°C) (McDaniel 1987:2). During the generally mild winter season, the prevailing winds alternate between moist, mild, tropical air from the south and dry, cool, polar air from the north. Winter temperatures rarely drop much below 50°F (10°C), although they may get as low as 20 to 30°F (-7 to -1°C) in some years. Extremely cold weather seldom lasts for more than 3 to 4 days at a time.

Rainfall suffices to cultivate a wide variety of crops and pasture plants. The average annual rainfall is 64 in (150 cm). Nearly 50 percent of the annual precipitation falls in April through September, corresponding to the growing season (McDaniel 1987:2). Rainfall generally occurs in the form of showers or thundershowers; prolonged steady rains are infrequent and occur in winter. Severe weather in Louisiana varies and defies prediction. Generally, intermittent hurricanes and storm surges occur between June and November. Tornadoes occur on average once every eight years. During the spring and fall, severe thunder squalls and damaging hailstorms are more rare, occurring on average every 14 and 20 years, respectively (Murphy et al. 1977:2). Extended droughts are rare as is measurable snowfall.

Regional Vegetation

Elevation of the land and the associated variation in soil saturation influences the distribution and composition of plant communities. Differences of less than a meter in elevation can result in striking changes in vegetation (White et al. 1983:103). The current project area contains natural levees, forested wetlands, and cypress-tupelo swamps. Natural levees receive primary focus, since they dominate the environment.

Areas that are blanketed by annual floods with sands and silt contain a growth of cottonwood (*Populus deltoides*), American sycamore (*Platanus occidentalis*), redgum/sweetgum (*Liquidambar styraciflua*), black willow (*Salix nigra*), hackberry (*Celtis laevigata*), swamp privet (*Forestiera acuminata*), honey locust (*Gleditsia triacanthos*), and water locust (*G. aquatica*). Old natural levees contain an upper canopy of redgum/sweetgum, cherrybark oak (*Quercus pagoda*), cow oak (*Q. prinus*), Nuttall oak (*Q. nuttallii*), Shumard oak (*Q. shumardii*), water oak (*Q. nigra*), honey locust, American elm (*Ulmus americana*), winged elm (*U. alata*), pecan (*Carya illinoensis*), and common persimmon (*Diospyros virginiana*). Along the margins of stream courses and abandoned meanders of the Mississippi River, bald cypress (*Taxodium distichum*), swamp privet, water locust, and water elm (*Planera aquatica*) are found. Natural levees of these old courses and meanders are elevated and contain redgum/sweetgum, overcup oak (*Q. lyrata*), bitter pecan (*C. lecontei*), common persimmon, hackberry, and cherrybark oak.

The most common shrub species in the project area are palmetto (*Sabal minor*) and green haw (*Crataegus viridis*). Occasional possum-haw (*Ilex decidua*) thickets also occur. Vines are quite striking and common, including poison ivy (*Rhus toxicodendron* var. *vulgaris*), Virginia creeper (*Parthenocissus quinquefolia*), supple-jack (*Berchemia scandens*), pepper-vine (*Ampelopsis arborea*), muscadine (*Vitis rotundifolia*), hemp-weed (*Mikania scandens*), touch-me-not (*Impatiens capensis*), water paspalum (*Paspalum* sp.), and pokeweed (*Phytolacca americana*) (Gibson 1978:97; White et al. 1983:103-104). Herbaceous ground cover is generally absent.

Bahr and Hebrard (1976:13) observe that swamps occur in areas where the soil is "...usually saturated or covered with water for one or more months of the growing season." True swamp forest is dominated by bald cypress and tupelo gum (*Nyssa aquatica*). Other vegetation present includes swamp maple (*Acer rubrum* var. *drummondii*) and Drummond red maple (*A. drummondii*). Additional species in the community include, green ash (*Fraxinus pennsylvanica*), black willow (*Salix nigra*), water hickory (*Carya aquatica*), water oak, American elm, winged

elm, and river birch (*Betula nigra*). Understories are rare in this forest type due to frequent inundation and large mature individuals obscuring the forest "floor".

The shrub layer includes wax-myrtle (*Myrica cerifera*), and buttonbush (*Cephalanthus occidentalis*). Common climbing vines include poison ivy, evening trumpet flower (*Campsis radicans*), greenbrier or cat-briar (*Smilax* spp.). Spanish moss (*Tillandsia usneoides*), mistletoe, ferns, and lichens are also represented.

Swamp forests have herbaceous ground cover such as smartweed (*Polygonum* spp.), alligator-weed (*Alternanthera philoxeroides*), swamp-potato (*Sagittaria lancifolia*), red iris (*Iris fulva*), blue iris (*Iris giganticaerulea*), and bur-marigold (*Bidens laevis*) (White et al 1983:105). Water hyacinth (*Eichhornia crassipes*) is an introduced species thriving in recently disturbed areas such as canals and floodways.

Peripheral to the swamps are expanses of poorly drained soils that are drier than the swamps. The areas contain an upper canopy of overcup oak, bitter pecan (*Carya lecontei*), green ash (*Fraxinus pennsylvanica*), willow (*Salix* spp.), water oak, and hawthorns (*Crataegus* spp.). A diverse array of shrubs and bushes are found, including asters (*Aster* sp.), elderberry (*Sambucus canadensis*), and several varieties of maple (Brown 1945). Other ground cover includes spikerush (*Eleocharis* sp.), alligator-weed, sedge (*Cyperus odoratus*), cat-tail (*Typha* spp.), water millet (*Echinochloa walteri*), water hyssop (*Bacopa monnieri*), smartweed, three-cornered grass (*Scirpus olneyi*), and giant cutgrass (*Zizaniopsis miliacea*) (Bahr and Hebrard 1976:Table 2).

Regional Fauna

Animals were exploited not only as a food source, but also for a variety of other purposes. Animal species may be restricted to specific types to some extent on the basis of plant species or other factors, such as water, but there will also be some movement of animals between environmental units. Thus, deer may be found at times in any of the units discussed, depending in part on seasonal availability of plant resources and varying annual conditions, such as drought. Most animals in south Louisiana are not restricted to a particular range; however in the following discussion they are grouped with the environmental unit in which they are most common.

The higher elevations of forested lands and natural levees offer the best habitat for terrestrial animals. During the fall, various mast-bearing trees attract a variety of mammals and birds. Native mammals common in this environment include the opossum (*Didelphis virginiana*), fox squirrel (*Sciurus niger*), white-tailed deer (*Odocoileus virginianus*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), mink (*Mustela vison*), striped skunk (*Mephitis mephitis*), red fox (*Vulpes fulva*), bobcat (*Lynx rufus*), black bear (*Euarctos americanus*), and wolf (*Canis niger*). Common amphibians and reptiles include the green treefrog (*Rana clamitans*), box turtles (*Terrepenne* spp.), ground skink (*Lygosoma laterale*), copperhead (*Agkistrodon contortrix*), black racer (*Coluber constrictor*), and rat snake (*Elaphe obsoleta*) (Yakubik et al. 1998:12).

Within swamps, aquatic and semi-aquatic species are the most abundant animals. Native mammals are swamp rabbit (*Sylvilagus aquaticus*), white-tailed deer, and raccoon (Bahr and Hebrard 1976:23). Also, otters (*Lutra canadensis*) and mink (*Mustela vison*) are found on occasion. Birds include osprey (*Pandion haliaetus*), red-shouldered hawk (*Buteo lineatus*), kingfishers (*Megascops alcyon*), and herons and egrets (Ardeidae) (Bahr and Hebrard 1976:21, 23). Fish species found in area waterways include the blue catfish (*Ictalurus furcatus*), channel catfish (*I. punctatus*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), and bowfin (*Amia calva*) (Bahr and Hebrard 1976:22-23; Department of Conservation 1933). Reptiles include alligator (*Alligator mississippiensis*), various turtles (Testidunes), skinks, and cottonmouth moccasins (Bahr and Hebrard 1976:21, 23).

Geoarcheological Expectations

The potential for the occurrence of archeological deposits within the proposed levee ROW is very poor. As discussed above, the survey area in part lies on the distal edge of the natural levee where it merges with the backswamp. This transitional area is the most poorly drained and most frequently flooded part of the natural levee, and differs little from the adjacent backswamp. Poor drainage, frequent flooding, and heavy clay soils that impede crop cultivation would have made this area an undesirable place to settle for both prehistoric and historic populations. In addition, the land within the survey area lies a considerable distance from the Mississippi River or any bayou that could have been used for transportation. The higher, drier, and sandier natural levee crest adjacent to the Mississippi River would have been a far more hospitable location for settlement.

In case of the crevasse splay adjacent to LaPlace, the numerous channels and ridges it exhibits demonstrate that it was active during major river floods prior to the construction of the artificial levees. The periodic flooding of the crevasse splay would have made it a most uninviting location for both farming and settlement. In addition, it would have been an area of active reworking and reburial of the natural levee. Any prehistoric archeological deposits that accumulated here would have been either eroded or deeply buried by the periodic flooding.

CHAPTER 3 PREHISTORIC OVERVIEW

No prehistoric sites have been identified in the area immediately surrounding the proposed levee ROW. As noted previously, the potential for the occurrence of prehistoric archeological deposits within the proposed ROW is very poor. The natural environment along the project ROW created an unfavorable setting for both settlement and crop cultivation. Prehistoric populations instead would have utilized the crest of the natural levee adjacent to the Mississippi River for settlement and cultivation. The following overview therefore addresses general trends in subsistence and settlement patterns of prehistoric populations found in the region surrounding the project area.

Paleo-Indian Period

Although a conservative date for the emergence of Paleo-Indian populations into North America has been estimated at 38,000 B.C., there is no hard evidence placing these groups in Louisiana prior to 10,000 B.C. The earliest known projectile points from Louisiana are of the Clovis, Plainview, Scottsbluff, Folsom, and Meserve types. These lanceolate points appear in both fluted and non-fluted varieties, with both straight and concave basal-edges, and are largely manufactured from gray and brown flint and novaculites from areas of Texas and Arkansas (Neuman 1984:66-68). Lithic materials of these same types have been positively associated with extinct Pleistocene megafauna in other parts of the continent, thereby allowing projected dating of Prehistoric occupation in Louisiana to between 10,000 B.C. and 8,500 B.C. (Neuman 1984:59).

Due to the scarcity of Paleo-Indian sites in Louisiana, few specifics are known about the social make-up of the state's resident Paleo-Indian groups. In general, Paleo-Indian populations consisted of small bands of hunters and gatherers adapted to river-edge environments. These populations relied on the Pleistocene megafauna for subsistence, as well as on many species also hunted in later times (Steponaitis 1986:369). The Paleo-Indian component of the Salt Mine Valley site (16IB23) on Avery Island, Louisiana includes artifacts associated with the bones of extinct fauna such as mastadon, horse, bison, and sabertooth cats (Aten 1983:145).

The extinction of many of these animal species at the end of the Pleistocene resulted in more diverse cultural adaptation by the end of the Paleo-Indian period. Lithic technologies reflect this shift in adaptation. Beginning at approximately 8,500 B.C., point-type distributions and other archeological evidence indicate increased rationalization throughout the southeastern U.S. (Aten 1983:147; Neuman 1984:69).

Archaic Period

The Early Archaic (8,000 B.C.-6,000 B.C.) is characterized by a shift from the hunting of megafauna to the exploitation of more specialized local resources. The settlement system of Early Archaic populations continued to utilize riverine environments, where evidence points to a continuation of small bands occupying temporary camps. However, there is an overall increase in population density during this period. Although projectile point technology changes during the Early Archaic, there are continuities with earlier Paleo-Indian types. Major diagnostic attributes of Early Archaic projectile points include a smaller, triangular shape and notched base. The Big Sandy, Dalton, and Kirk types are examples of Early Archaic point types (Bense 1994:65).

During the Middle Archaic (6,000 B.C.-4,000 B.C.) the postglacial warming trends peaked in a climatic event known as the Altithermal. This hot, dry period resulted in changes to forest and riverine environments throughout the southeast (Bense 1994:75; Walthall 1980:58).

Deeply stratified deposits from this period seem to indicate regular seasonal occupation of sites (Neuman 1984:76-77). The Middle Archaic witnessed the beginnings of plant domestication, with the cultivation of the bottle gourd (Bense 1994:90). The numbers and types of projectile points found in archeological assemblages from the Middle Archaic continued to increase. It was during this period that the process of heat-treating chert to facilitate in the manufacture of lithic tools was developed. Middle Archaic chipped stone points include basally notched forms and a variety of stemmed shapes (Bense 1994:75, 85).

Aten (1983:157) relates that in the upper Texas/Louisiana coastal zone there is "little theoretical basis for deducing the nature of change from the Middle to Late Archaic, except perhaps from cultural ecology." The Late Archaic (4,000 B.C.-1,000 B.C.) is characterized in the Southeast by the arrival of modern climates and stabilization of sea level. Settlement systems shifted as populations took advantage of wetland habitats in river valleys and along the coast. Regular exploitation of these environments resulted in increasing sedentism and domestication of plants. Pestles and grinding stones recovered from Late Archaic sites further indicate increased familiarity with plant resources, habitats, and growing seasons (Bense 1994:90; Fuller and Kelley 1993:20-21; Neuman 1984:78-79). Other lithic artifacts from this period include polished stone pendants, plummets, and beads (Hudson 1976:44). The presence of large quantities of non-utilitarian objects during the Late Archaic indicates that ritualized activities may have had an increased role during this period.

Poverty Point Period

The Poverty Point culture (1,500 B.C.-500 B.C.) serves as a transition from the late Archaic to the early Woodland period and appears to have been centered along Bayou Macon in northeastern Louisiana. Poverty Point sites are also spread throughout Louisiana, eastern and southern Arkansas, western Mississippi, southeastern Missouri, and along the Gulf coast to Florida. The name Poverty Point is derived from the type site, 16WC5, an area of massive earthwork construction in West Carroll Parish, Louisiana (Ford and Webb 1956; Gibson 1983; Neuman 1984).

The Poverty Point period represents the florescence of long-distance trade already evident in the late Archaic, including importation of exotic cherts and other lapidary materials from the central United States, the Great Lakes area, Alabama, and Georgia (Neuman 1984:101-102). Diagnostic artifacts include tiny microlithic perforators, fired clay objects, tubular pipes, clay figurines, rough hoes and celts, and jasper beads. It has been proposed that the fired clay objects were used for stone boiling, since stones are scarce in the alluvial regions. Pottery sherds recovered include fiber-, sand-, or clay-tempered wares. Both steatite and sandstone bowls have also been recovered from Poverty Point contexts (Webb 1982:12-13). Motley points, often made from non-local cherts, are the index point type for Poverty Point sites. Both Epps and Gary type points are also present at Poverty Point sites (Heartfield, Price and Greene 1985:8; Neuman 1984:99). The presence of atlatl weights and an antler atlatl hook in the assemblage from 16WC5 indicate that spear throwers were utilized. Pitted stones and grinding basins may have been associated with the processing of nuts and seeds for food.

Evidence from the Copes site (16MA47) in northeastern Louisiana indicates that at least some settlements in Poverty Point times were occupied year-round and had a diverse subsistence base with an emphasis on hunting and fishing (Jackson 1982:73-86; 1989:173-203). Exploitation of deer, squirrel, rabbit, raccoon, turkey and other wild birds, turtle, and numerous species of fish followed a pattern already well established in the Early- to Middle-Archaic (Jackson 1989; Steponaitis 1986:371). Recovery of squash at the Copes site and the variety of edible plants available in the Lower Mississippi Valley suggest that gathering may have been supplemented by small-scale gardening (Gibson 1970, 1990).

Several sites in the vicinity of the current project area are dated to the Poverty Point period. The Linsley (16OR40) and Garcia (16OR34) sites are located in Orleans Parish (Gagliano and Saucier 1963) and the Bayou Jasmine site (16SJB2) is located at the western end of Lake Pontchartrain (Duhe 1977; Gagliano and Saucier 1963:Figure 1). The Linsley site is situated on a buried natural levee associated with an early course in the Mississippi River, while the Garcia site consists of an eroding *Rangia* beach deposit. The evidence for a Poverty Point component at the Garcia site is relatively scarce, and consists primarily of microlithic tools and a variety of chipped and polished stonework (Gagliano and Saucier 1963:326, Table 1).

Tchula Period

Tchula period occupations in the Lower Mississippi Valley are equated with the Tchefuncte culture. The period has also been identified as the Formative (Jenkins and Krause 1986), or Early Ceramic period because, with the exception of fiber-tempered pottery, it was the interval during which initial pottery complexes appeared in the Lower Mississippi Valley (Neuman 1984:113, 122). Sites are few and scattered, with most occupations found in the coastal zone (Neuman 1984). These data are interpreted to suggest that the peoples of the Tchefuncte culture were largely seminomadic hunters and gatherers (Neuman 1984:135). However, within subareas such as South Louisiana, regional artifact markers, primarily Tchefuncte type ceramics, are useful for recognizing occupations (Phillips 1970:7, 8, 15, 76) and possibly for defining regional populations (Shenkel 1981; Weinstein 1986).

Peoples of the Tchefuncte culture were the first to engage extensively in the manufacture of ceramics. Fiber-tempered and some grog-tempered or temperless sherds have been recovered from earlier Poverty Point contexts (Webb 1982). These may represent primarily trade goods from the earliest pottery-making cultures in the east. The basic Tchefuncte ware is temperless or grog-tempered, with accidental inclusions of small quantities of sand and vegetable fiber. Sand-tempered wares represent a minority constituent of Tchefuncte site (16ST1) assemblages (Shenkel 1984:47-48). Ceramic decorations and various percentages of these decorations have been used to create several regional phases of the Tchefuncte culture in the study area (Weinstein 1986). The Pontchartrain phase is considered the earliest Tchefuncte manifestation in the region, and is thought to date from ca. 500 B.C. to ca. 250 B.C. Pontchartrain phase sites are moderately common in the Pontchartrain Basin. The most notable of these sites are the Tchefuncte site (16ST1) in St. Tammany Parish, and the Big Oak (16OR6) and Little Oak Island (16OR7) sites in Orleans Parish (Ford and Quimby 1945; Neuman 1984; Shenkel 1981, 1984; Shenkel and Gibson 1974). A later Beau Mire phase has been proposed to encompass the period from ca. 250 B.C. to A.D. 1, although this phase is not accepted by all researchers (Shenkel 1981, 1984; Weinstein 1986; Weinstein and Rivet 1978).

Tchefuncte sites in the study area are confined to the areas around Lake Pontchartrain and appear to be associated with relatively early river channels and lake margins. Tchefuncte subsistence is fairly well known. Excavations at the Big Oak Island and Little Oak Island sites suggest an emphasis on hunting and fishing (Shenkel 1981, 1984). Shenkel (1981:331) argues that these two sites initially had occupations that supported permanent or semi-permanent villages. Later, there is evidence that there may have been functionally different occupations, with Big Oak Island evolving into a specialized shellfish and fish procurement and processing station (Shenkel 1981, 1984) that was unquestionably associated with the contemporaneous village component at the Little Oak Island site (Shenkel 1981:331-332, 1984). Shenkel (1981:333-334) emphasizes the narrow range of exploited foods (primarily *Rangia* clams and marsh-estuarine fish and mammals) in the Pontchartrain phase, noting that many other equally productive resources were virtually ignored.

Social complexity was relatively minimal in the Tchefuncte culture. Settlements are generally small and lack certain evidence of earth works or other complex features. Burials are com-

common, but rarely, if ever, contained grave furnishings. The evidence for earthen structures, such as mounds, is debatable. Low, domed mounds have been associated with Tchefuncte culture sites, but the data for securely attributing these constructions to the Tchefuncte people are limited (Neuman 1984:117, 135; Toth 1988:27). Unlike earlier Poverty Point culture, Tchefuncte people did not import non-local or exotic lithics to their sites, nor did they engage in lapidary art to the best of our knowledge.

Marksville Period

The Marksville period (A.D. 1-A.D. 400) is generally subdivided into two sequential temporal units, Early Marksville and Late Marksville. The Early Marksville period is associated with Hopewellian traditions manifested throughout the Lower Mississippi Valley (Phillips 1970:7, 17-18, 886; Toth 1988). The Hopewell Tradition has two major centers of development in Ohio and Illinois, and dates to between 200 B.C. and A.D. 400. Diffusion of aspects of the Hopewell culture may have resulted from the activity of traders who established a wide-ranging network, sometimes termed the "Hopewellian Interaction Sphere" (Caldwell 1964). Despite the presence of non-local materials in Hopewell-related sites, Marksville period sites in Louisiana have yielded relatively few exotic items. Conical earthen burial mounds are typical of the early Marksville period (Toth 1988).

The Late Marksville period appears to witness an increase in cultural diversity in the Lower Mississippi Valley and along the coast. In much of the Lower Mississippi Valley, the Issaquena culture developed over several centuries beginning around A.D. 200 (Gibson 1977, Williams and Brain 1983). Along the peripheries of the Lower Mississippi Valley, other cultural variants developed which were clearly contemporaneous with the Issaquena culture, but did not share the same cultural context (Belmont 1984).

Lithic artifacts recovered from Marksville sites are not very distinctive. Stemmed points with corner and/or side notches are common. Many Archaic projectile point types persist, notably the Gary and Ellis varieties. Other lithic artifacts include scrapers, celts, drills, hammer stones, and flake tools. Ground stone pendants, beads, and plummets have also been recovered. The use of bone tools is demonstrated by the presence of bone awls and fishhooks.

Faunal remains from Marksville sites include gar, catfish, turtle, and various reptiles. Evidence suggests a broad-based diet of fish, deer, and smaller mammals. The floral assemblage from Marksville sites includes acorns, persimmons, palmettos, grapes, and blackberries/raspberries (Kidder and Fritz 1993:291). Gerald Fowke reported maize and squash from the Marksville site in 1920 (Fowke 1927, 1928; Byrd and Neuman 1978:16), although efforts to relocate the maize sample have been unsuccessful. Despite evidence suggesting the increasing importance of agriculture, most samples recovered from Marksville period sites indicate continued exploitation of resources in a subsistence economy based largely on hunting and gathering.

Baytown Period

The Baytown period (A.D. 400-A.D. 700) has been defined as the interval between the end of the Hopewellian inspired Marksville culture and its later Issaquena related descendants, and the emergence of the Coles Creek culture. The Baytown period is often referred to as the "Troyville period" by Delta archeologists. Because of the perceived lack of diagnostic markers for the period in southeastern Louisiana, the Baytown period was once assimilated with the subsequent Coles Creek period, and the two discussed as the "Troyville-Coles Creek cultures" (e.g., Neuman 1984).

Most aspects of the Baytown period are poorly understood. This has led some archeologists to characterize the period as an era of cultural decline following the Hopewellian flores-

cence (Griffin 1967:187; Phillips 1970:901). However, there are indications that this period may be a time of population growth and increased social integration (Styles 1981). Although available evidence is relatively scarce, archeological deposits suggest that Baytown period habitation sites included both small hamlets and large communities with mounds (Kidder 1993:18). Moreover, Kidder (1993:19) indicates Baytown period subsistence is probably a continuation of earlier Marksville hunter-gatherer patterns.

As with most post-Archaic cultures in the Lower Mississippi Valley, more is known about the ceramics produced by Baytown period groups than about other aspects of their lifeways (Kidder 1993:13-18). Ceramics associated with Baytown period occupations include two new painted pottery complexes, Quafalorma and Woodville, as well as a new type of incised decoration known as French Fork Incised. Other ceramic types recovered from archeological contexts include Baytown Plain, Mulberry Creek Cord-marked, Salomon Brushed, and Alligator Incised. During the later portion of the Baytown period, there seems to be a general increase in quality of ceramics produced, as well as an increase in social/status differentiation between individuals within the society (Kidder 1993:20).

Both Scallorn and Alba type projectile points are present in Baytown period sites, although lithic artifacts as a whole are generally rare. Smaller projectile points are found, suggesting the introduction of the bow and arrow during this period. Other stone tools from Baytown sites include drills and scrapers, and various ground stone artifacts such as hammer stones and grinding basins. Local Pleistocene gravels were the primary lithic resource used for the production of chipped stone tools.

Coles Creek Period

The Coles Creek period (A.D. 700-A.D. 1200) begins with the emergence of Coles Creek culture in the southern part of the Lower Mississippi Valley and ends with the establishment of "full-blown" Mississippian culture in the northern part of the Valley (Phillips 1970:18). Diagnostic Coles Creek type ceramics appear to have evolved from the ceramic traditions of the Deasonville phase of the Baytown period in the Tensas and Lower Yazoo River valleys, suggesting a degree of cultural continuity between the periods (Bitgood 1989:134-138). In addition, many Coles Creek sites, which typically consist of a group of mounds around a plaza, appear to be built over earlier Baytown period platform mounds (Kidder 1993:22).

The substantial pyramidal and flat-topped mounds of the Coles Creek culture functioned as substructures for religious and/or civic buildings (Ford 1951; Williams and Brain 1983). Excavations at numerous Coles Creek sites have uncovered the remains of associated circular structures both on mound summits and beneath mounds. The outer walls of these structures consisted of either a single or double ring of support posts set into the ground individually or within a wall trench. These structures may have been mortuary buildings akin to those known from later Mississippian sites (Brown 1985). Major Coles Creek sites with circular structures include Medora (16WBR1) (Quimby 1951), Greenhouse (16AV1) (Brown 1985:258), Mount Nebo (16MA18) (Brown 1985:259; Neuman 1969), St. Gabriel (16IV128) (Woodiel 1980, 1993), and Morgan (16VM9) (Fuller and Fuller 1987).

Information on subsistence during the Coles Creek period comes from a variety of studies. Faunal data from Coles Creek sites suggest seasonal variation, with fish, mussels, and turtle exploited in the spring and summer. Deer appear to have been hunted during the summer, fall, and winter (Kelley 1992:233-234). Important species of fish utilized by Coles Creek populations included gar, freshwater drum, bowfin, and catfish. Small mammals included raccoon, beaver, opossum, swamp and cottontail rabbit, and gray and fox squirrel (Kelley 1992:234).

While later Mississippi period societies clearly operated on an agricultural base, there is little evidence to date linking the development of cultural complexity during the Coles Creek period with the development of agriculture. Domesticated plant species are present at Coles Creek sites, indicating some degree of cultivation. However, they represent only one component of a diet that also included many wild or semi-domesticated plants. Floral remains recovered at Coles Creek sites include starchy seed plants and squash rind. In addition, one pit from a late Coles Creek context at the Osceola site (16TE13) contained hundreds of carbonized kernels of maize (Kidder and Fritz 1993:292). While this points to the introduction of maize into the diet after A.D. 1000, the overall profile of plant use at the sites suggests reliance on other plants.

The current consensus of opinion among archeologists is that the Coles Creek period represents the rise of chiefdom-level societies in the Lower Mississippi Valley. However, the emergence of social rank and of regional political centers seems to occur only at the end of the period (Kidder 1992:29-30; Steponaitis 1986:386; Woodiel 1993:121; Nassaney and Cobb 1991:302-306). Belmont (1984:276-278) at one time framed a model for Coles Creek settlement that hypothesized secondary mound sites arranged around a principal center. Currently this model seems to owe more to incomplete recording of Coles Creek sites than it does to actual settlement pattern. Site density, including the number of mound sites, increased along the Ouachita, Tensas, and Yazoo rivers during the Coles Creek period. For much of the period, mound centers do not seem to be organized according to a hierarchy. Unlike later Mississippi period mound centers, which clearly have numerous mound complexes clustered around one preeminent or regional center, Coles Creek mound centers tend to be uniform in size and site complexity (Williams and Brain 1983:407; Kidder 1992:29). The absence of paramount sites along the Ouachita and Tensas rivers is in accord with a similar absence for evidence of strong political centralization or marked differences in social status. Hence, the period seems best understood as engendering the forerunners of later, stratified societies.

Mississippi Period

The beginning of the Mississippi period (ca. A.D. 1200-A.D. 1700) is marked by the appearance of emergent Mississippian culture in the northern part of the Lower Mississippi Valley and throughout much of the interior Southeast. Mississippian culture characteristics, such as shell tempering and the use of maize agriculture, did not penetrate into much of the central Lower Valley. Plaquemine culture is the term used to denote the indigenous late prehistoric populations of most of the Lower Mississippi Valley and adjacent coastal regions. Archeological evidence suggests that Plaquemine culture emerged from a Coles Creek base and was later influenced by Mississippian intrusions from further up the Mississippi River Valley.

The Plaquemine culture shares a number of traits with the earlier Coles Creek culture, including pottery techniques, ground stone celts, elbow-shaped clay pipes, multi-stage mound construction, and mortuary practices including mass burials (Neuman 1984:258). However, Plaquemine ceramics are easily distinguished by features such as small projecting lug handles on vessel rims, and by decorative techniques such as brushing (Neuman 1984:258-259). Chipped stone points from the periphery of the Plaquemine zone include Bayougoula Fishtailed and Ashley types. In the central Plaquemine area, chipped stone tools were not part of the assemblage, but instead bone and antler points were utilized (Jeter and Williams 1989:206; Williams and Brain 1983:342).

Plaquemine culture provides the first definite evidence for a ranked society in the late prehistoric period. The groups appear to have had chiefdom-level political systems, with differential access to goods. Some sites show evidence of specialization in the production of certain classes of material goods. In many parts of the Southeast, there appears to have been a hierarchy of sites associated with Plaquemine culture. Weinstein and Kelley (1992) suggest a hierarchically organized settlement pattern for the late prehistoric communities in the Terrebonne marsh

area, involving mound communities, lesser villages, and seasonal resource collecting stations or camps. Along Bayou Lafourche, Altschul (1978) identified two temporally distinct patterns, corresponding to what are identified as Plaquemine and Mississippian cultural occupations. The earlier, Plaquemine pattern evidently involved a seasonal pattern of movement focusing on a centralized fall/winter community located on interior forested levees, with spring/summer occupations consisting of dispersed habitations spread across most major landforms, but especially emphasizing the exploitation of marsh and coastal resources (Altschul 1978:184-186). There is minimal evidence for status differentiation in and among these communities (Altschul 1978:186). The second pattern described by Altschul is associated with the "Mississippian" occupation of the region (1978:186). In this model, large, sedentary mound communities occupied elevated levees, and were surrounded by dispersed homesteads. While no definitive evidence of plant domestication has been discovered, the location and complexity of these sites seems to indicate that domesticates were heavily utilized (Altschul 1978:186).

CHAPTER 4 HISTORIC OVERVIEW OF ST. JOHN THE BAPTIST PARISH

Introduction

St. John the Baptist was one of the 19 original parishes created by the territorial Legislature in 1807, although previously in 1804 it had been one of the original 12 counties, as designated by the territorial legislative council. A part of the German coast, the parish derived its name from the old German settlement of St. John. The parish seat is located in Edgard, and the parish is bounded by Livingston Parish, St. Charles Parish, Lafourche Parish, St. James Parish, and Ascension Parish.

Colonization and the Antebellum Period

The initial European settlement in what is now St. John the Baptist was by a colony of Germans who arrived in New Orleans on June 4, 1721, aboard a vessel named the *Portefaix*, along with another 250 Germans under the command of Chevalier Charles Frederick D'Arensbourg, a former officer in the Swedish army (Laurent 1923:11). These colonists were supposed to join other colonists located along the Arkansas River; but upon learning of the failure of John Law's economic colonial venture, the *Compagnie des Indes*, the Arkansas colonists had left their concessions and returned to New Orleans to demand passage back to Europe. Faced with a mass exodus of colonists, Governor Bienville sought to pacify them by offering them a settlement on the Mississippi River, 35 miles above New Orleans. The new settlers were not considered *engagés*, or indentured agricultural workers, but *habitants* owning concessions in the company. In return for their small concessions and tools, the new settlers had to sell their products to the company. This contract was nullified with the collapse of the company, but the *habitants* remained owners of their property and the small colony of Germans began to flourish, so much so that the area on both sides of the river was called the *Côte Des Allemands* (German Coast). Another sign of the richness of the land upon which the habitants had settled was that the Ouacha Indians had cultivated the land there as late as 1721. The small settlement was called *Aux Ouacha ou le village des Allemands* (Blume 1990:7-12, 15).

According to the 1724 census, some of the German coast settlers were: Simon Lambert, Conrad Friedrich and his wife, Johann Georg Troxler and his wife, Johann Adam Matern and his wife and child, Ambros Heidele and his wife and daughter, Michael Horn and his wife and child, Johann Rommell and his wife, Andreas Treager and his wife and child, Jacques Poche, Joseph Wagensbach, Johann Jacob Folts, Jacob Huber, Thomas Lesch, Johann Weber, Michael Zehringer, Nik Wichner, Jacob Schaf, Hans Reinhard Schecksneider, Jean Zweig, Louis Champagne, Jacques Antoine Le Borne, Pierre Brou, Joseph Keller, Nikolaus Ory, Joseph Milhet, Johann Bapt. Manz, and Karl Friedrich D'Arensbourg, who was honored by having the settlement named "Karlstein" for him (Laurent 1923:16-20).

The northern half of the parish was settled by Acadians expelled from Nova Scotia. On November 16, 1765, a colony of 216 Acadians arrived in New Orleans and the lame-duck Governor Aubry authorized them to form a settlement beginning at the upper part of the German Coast. Established at the village of Wallace, the settlement soon spread to Vacherie, in what is now St. James Parish. Additional settlers came from New Orleans and directly from France, which resulted in an eventual preponderance of Creoles in this area. Governor O'Reilly designated it the Parish of St. John the Baptist in 1772 (St. John the Baptist Parish Development Board 1955:7; Brasseaux 1987:74-78, 102).

The northern portion of the German Coast was first surveyed by the Spanish in 1769 by a team of surveyors under the command of Don Roberto Robin. That same year the first church

and cemetery in the parish were planned. The site, involuntarily donated by a man named Jaques Dubroc (who had no family and the perfectly located piece of property) under order of Spanish Governor O'Reilly, is now occupied by the Church of St. John the Baptist in Edgard. The first records of the parish begin in 1772. The original church was destroyed by a flood in 1821 (Laurent 1923:44-45). In 1804, the territorial legislative council officially designated the parish as the parish of St. John the Baptist, and it was approved again in the territorial legislature in 1807. The first parish seat was established at Bonnet Carré Point (present-day Lucy). The first judge of the parish was Judge Terence Le Blanc, and the first justices of the peace were George Haydel, Gabriel Gontenot, and Norbert Boudousquié (Laurent 1923:70).

In 1812, the white population of St. John the Baptist Parish was 1450 persons, as well as 80 Free People of Color (Laurent 1923:84). The crops grown by most planters were rice and sugar, although indigo had once been a popular, yet demanding, venture. Sugar, while still a complicated production process, quickly emerged as the principal economic activity in St. John the Baptist Parish. Owners of sugarhouses in the parish in the early nineteenth century were A. Trouard, George Wimprende, A. Andry, George Deslondes, J.T. Haidel, J. Becnel, V. Marmillion, Joseph Perret, and two others, all of whom produced 530,000 pounds of sugar. There were also 28 indigo factories, two blacksmith shops, one powder factory, and three cotton mills (Laurent 1923:84-85). One of the plantations was actually owned by a local church. Perhaps due to a conflict of interest, or perhaps because it was the expedient thing to do, the church plantation, school, and courthouse lots were sold by the congregation to the police jury in 1894 (Laurent 1923:88).

Disaster struck in 1821, when the Poche crevasse occurred at Edgard, flooding the entire west side of the parish. In 1848 the parish seat was moved from Bonnet Carré Point to St. John (present-day Edgard). By 1850, the population had grown to 7,317 residents: 2,586 whites, 4,540 slaves, and 191 Free People of Color (Laurent 1923:91). Although the new parish seat was known as St. John, the name was changed because of the local post-master, Edgar Perret. Residents would go to "Edgar's post-office", a designation that would ultimately refer to the town itself. The "d" was later placed on the end to distinguish the town from another post-office in the parish also named Edgar (Laurent 1923:92). The first newspaper in the parish, "Le Meschacebe", was established by Mr. De Bautte and Mr. Legendre and was written exclusively in the French language. By 1860 the parish had 7,932 residents: 3,037 whites, 4,594 slaves, and 299 Free People of Color (Laurent 1923:93-94).

Early in the nineteenth century, sugar cane became the dominant commercial crop throughout the alluvial parishes of southern Louisiana. St. John the Baptist Parish shared in the prosperity derived from commercial sugar agriculture. The intense cultivation of sugar cane with its numerous sugar mills on the plantations on each side of the river in St. John the Baptist parish produced such wealth that this area became known as "*La Cote D'Or*" or the "Gold Coast." The plantation owners in the current project area just prior to the Civil War were L. Tregre, J.B. Cambre (Star Plantation), Mrs. Antoine Boudousquié (Souvenir Plantation), William A. Madare, T. Alexandre, William L. Vicnair, Jacob and Company, F.L. Charbonnet, Andre Deslonde (Belle Pointe Plantation), Similien Labranche, A. Laiche, James Humphreys (Cornland Plantation) E. Daunois, E. Vicnair and Brothers, Mary Panis, M. Reine and Company, and Mrs. P. Ferrand (Figure 2). The Boudousquié plantation, which would eventually become part of Reserve Plantation, was acquired from Francois Rilleux and had 1,100 acres of improved land and 1,800 acres of unimproved land in 1860. The plantation had 116 slaves living in 40 slave dwellings, as well as 28 horses, 48 mules, 16 cows, 7 oxen, 28 sheep, 10 swine, and 28 "other cattle". Produced on the plantation were 274 hogsheads of sugar, 9,000 gallons of molasses, 4,500 bushels of Indian corn, 50 pounds of wool, 20 bushels of peas, 150 bushels of Irish potatoes, and 900 bushels of sweet potatoes (Menn 1964:360-361).

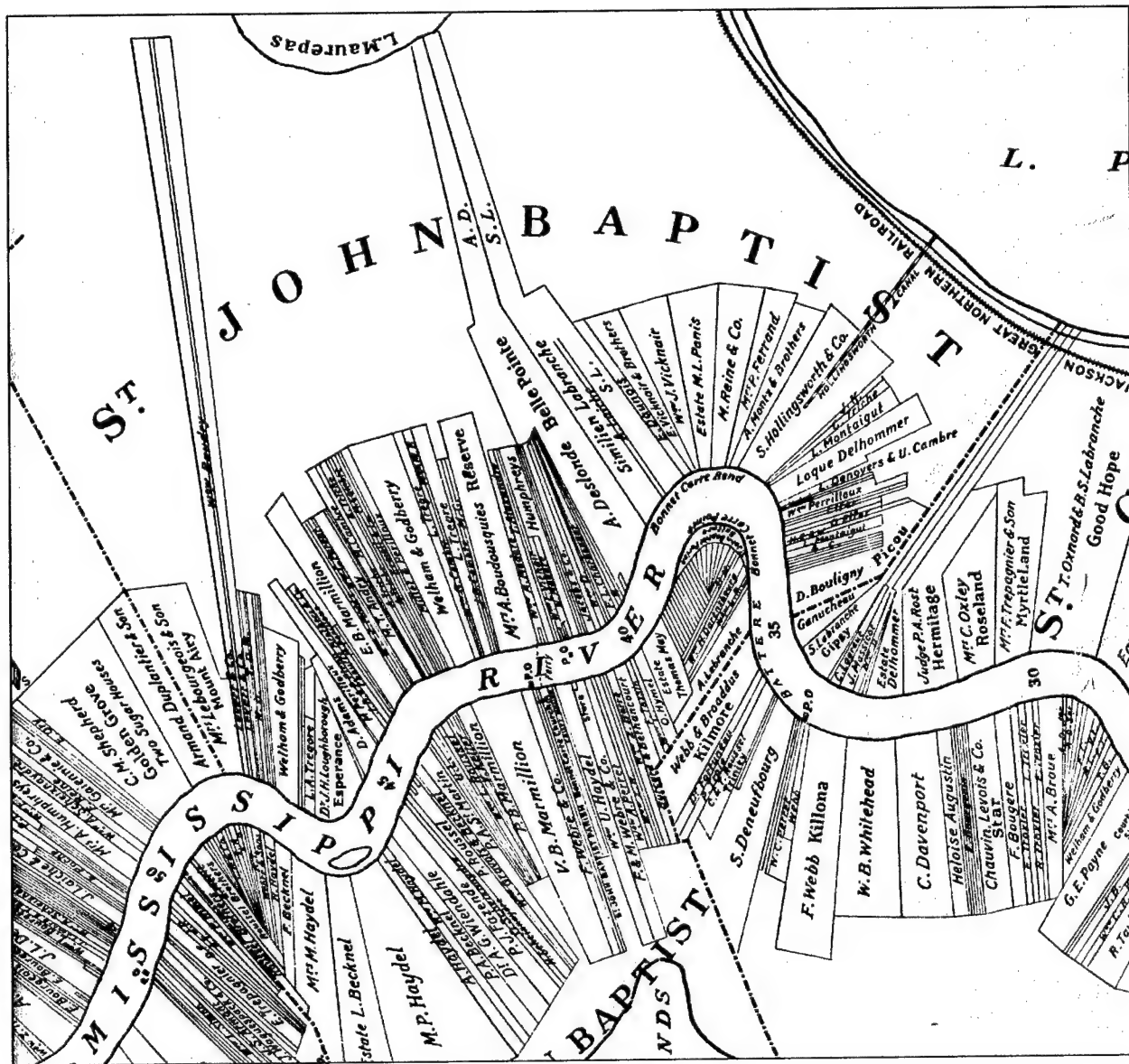


Figure 2. Excerpt from Norman's *Plantations on the Mississippi River between Natchez and New Orleans* (1858) showing the vicinity of the current project area.

Belle Pointe Plantation, owned by Andre Deslonde, was another of the prosperous plantations on the left bank of the river in St. John the Baptist Parish. Named for the long point in the river bank opposite it, the plantation consisted of 900 of improved acres and 1,500 unimproved acres, upon which 3,000 bushels of Indian corn, 50 pounds of wool, 50 bushels of beans and peas, 30 bushels of sweet potatoes, 212 hogsheads of sugar, and 16,000 gallons of molasses were produced. The plantation also was home to 141 slaves, 11 horses, 55 mules, 12 milch cows, 12 oxen, 100 sheep, and 15 "other cattle" (Menn 1964:360-361; Laurent 1923:175).

Table 1. Sample of Antebellum Sugar Production in the Project Area (Champomier 1850, 1860).

Plantation Owner, Name	1850	1860
E.B. Marmillion	280 hhd	205 hhd
Z. Monty & Parent, Z. Arcelin	165 hhd	21 hhd
Pierre Millet, G. Trégre and Frozi	175 hhd	60 hhd
Louis Trégre	223 hhd	46 hhd
Antoine Boudousquié, Reserve Plantation	344 hhd	222 hhd
Mrs. Andre Madère	102 hhd	34 hhd
Mrs. Laurent Vicknair	145 hhd	35 hhd
James B. and W.K. Humphreys, Cornland Plantation	202 hhd	106 hhd
Andre Deslonde, Belle Pointe Plantation	250 hhd	90 hhd

The Civil War (1861-1865)

Because of its location straddling the Mississippi River, St. John the Baptist Parish saw a heavy amount of gunboat traffic during the Civil War, and suffered from depredations by both the Confederate and Union armies, who scoured the plantations for foodstuffs and supplies. The west bank of the Parish bore the brunt of the devastation. The east bank, which is the location for the current project area, saw little in the way of activity by Federal troops. A Confederate camp of Texas Rangers was located on the Godberry (now Reserve) plantation. On July 19, 1863, one of the Rangers purportedly fired on the passing Federal gunboat Empire Parish, which had stopped at the Godberry plantation. The gunboat returned fire, lobbing five volleys of cannon shot at the house. All of the shots went wild, one taking off half of the roof of a slave cabin. Following this episode, the east bank remained largely quiet for the rest of the war (Laurent 1923:100).

The Late Nineteenth and Early Twentieth Centuries

Following the war, the sugar economy struggled to regain its pre-war prosperity. The dramatic shift in labor resources created greater financial stress on the already cash-strapped plantation owners. As a result, many owners proceeded to downsize their plantations. Sugar returns for the post-war period suggest that many of the antebellum owners survived by initially downsizing, then increasing their holdings as prosperity returned. A detailed discussion of the recovery of the sugar economy in the current project area is continued below in the discussion of Godchaux Sugars, Inc.

The vagaries of nature also dealt a cruel hand to the area. In 1872, the famous Bonnet Carré Crevasse incapacitated the left bank for eleven years. The channel that was carved linked the river to Lake Pontchartrain, and soon steamboats began taking sightseers up to the crevasse. Levees were built and drainage machines installed by planters to keep the crevasse waters from

destroying struggling crops, but the damage had been too great, and only enough sugar was harvested to resupply the store of seed cane. Besides the devastating loss of crops, planters were still obliged to pay taxes upon their inundated land. This double burden caused foreclosures on many left bank plantations for failure to pay taxes. The area of the worst inundation was frequently called "La Cravasse" (Laurent 1923:166).

Table 2. Sample of 1870 Sugar Returns for Plantations in the Project Area (Bouchereau 1870).

Plantation Owner, Name	1870
F. Millet, Hard Times	89 hhd
James Godberry, Jr., Terre Haute	260 hhd
A. Miltenberger & Co., Star	220 hhd
Leon Godchaux, Reserve	N.Y.
J.B. Humphreys, Cornland	70 hhd
N. Madere	N.Y.

At the beginning of the twentieth century St. John the Baptist Parish had a population of 12,330 people, many of whom were employed in agriculture. The rich, alluvial lands on both sides of the Mississippi River provided the basis for continued agricultural prosperity. By 1880, sugar was well on its way to recovery, and crop yields were rivaling or surpassing the record antebellum harvests. With the abundance of cane, the number of refineries needed for processing increased. Smaller plantations, however, began to sell or dismantle their sugar houses, because it was much more economically expedient to sell their cane to larger central sugar factories for processing. Godchaux-Henderson Sugar Company in Reserve was one of the first large central factories, and was still one of the largest industrial employers in the parish in the mid-1950s. Other major cane processing centers in the early twentieth century included the LaPlace Factory with a narrow gauge railway, a daily capacity of 600 tons of cane, and an annual output of 3.5 million pounds of sugar. Also in LaPlace, the New Era Factory was under the ownership of L. Montegut Jr., and Brothers. Smaller than the LaPlace Factory, the New Era mill had a daily production of 150 tons, and an annual production of 750,000 pounds of sugar. Woodland Factory was yet another mill in the LaPlace area, and had a daily capacity of 400 tons of cane and an annual production of three million pounds of raw sugar. The Hope Factory in the town of Lions was owned and operated by Ozeme Labiche. Its daily capacity was 300 tons of cane, and it had an annual production of 2.25 million pounds of sugar (Laurent 1923:127).

Although sugar and rice were the principal crops of the parish, oats, corn, hay, sweet and Irish potatoes, peas; oranges, figs, grapes, plums, quinces, peaches, pears, persimmons were cultivated as well. Cattle and hogs were also raised. Game included squirrels, coons, 'possums, rabbits, wild duck, partridges, becasines, snipes, and rice birds. The timber industry also flourished due to the prevalence of cypress, oak, gum, elm, cottonwood, and willow. The Lyon Cypress Lumber Co. operated in the parish from 1903 to 1931. Cypress was milled primarily until 1915, when the supply was exhausted, and the mill was then remodeled to cut pine and hardwood. The pine output was 225,000 feet of lumber daily, and the hardwood output was over 70,000 feet. By 1937 over 2.9 million board feet of cypress and 1.5 million board feet of ash and hickory had been cut in the parish (Eyraud and Millet 1939:49-50; Louisiana Dept. Commerce and Industry 1938:211).

By the mid-twentieth century, many of the smaller sugar mills had closed or had been bought by Godchaux Sugars for consolidation. Other major employers in the parish in the 1950s

were the Frisco Cane Company Factory in Lions, St. John Brickrete and Supply Company, and the Star Bakery in Garyville (St. John the Baptist Parish Development Board 1955:35). A notable twentieth-century trend was the growth of dairying and cattle raising as a sector of the agricultural economy. In 1954 livestock production contributed fifteen percent of the total farm income. Farm tenancy, a prevalent characteristic of cotton-growing parishes through the middle of the twentieth century, was not typical in St. John the Baptist Parish. According to the 1950 census, 79 percent of the farms in St. John the Baptist Parish were operated by the full owners of the farm, with very low percentages of share tenants. It was hypothesized that the high production costs and the prevailing low prices received for farm commodities at that time had a distinct influence on former tenants, causing them to shift to industrial work (St. John the Baptist Parish Development Board 1955:18).

By the mid 1920s, the parish boasted of 50 completed miles of state highways, two newspapers, two high schools, and two banks (Laurent 1923:1; LA Dept. of Agriculture and Immigration 1927:178). Railroads traversing the parish were the Yazoo and Mississippi Valley (1883), the Illinois Central, the Louisiana, Railway & Navigation (1906), the Chicago, St. Louis, and New Orleans, and the Texas and Pacific Railroads (Laurent 1923:1; Goins and Caldwell 1995:69).

The 1930 Census enumerated 14,078 residents in St. John the Baptist Parish, of whom 7,131 were white and 6,947 were African-American. Sugar was by far the leading economic industry, bringing approximately \$604,986 in cash income into the economy. Behind sugar was the rice industry, providing \$74,263 in cash income, and dairying, providing \$46,697 in cash income. There were also 130 retail stores, generating \$1.4 million in sales, two wholesale companies, and 10 manufacturing plants. The number of manufacturing plants increased to 17 plants by the early 1940s. The parish was also producing 1,296,000 board feet of lumber in 1940. As a sign of its relative prosperity, the parish in 1937 enumerated 968 automobile registrations, 73 telephones, and 1,560 electric refrigerators (LA Historical Society 1940:152; LA Dept. of Commerce and Industry 1937:191-192).

The Development of LaPlace

The first settlers on the east bank in the modern location of LaPlace were from across the river at the Karlstein settlement. As news spread of available, adequate lands for farming, other immigrants from settlements in New Orleans and Biloxi began to relocate to this area. The fledgling community was successful, although from the outset the new settlers were plagued by Colapissas Indians living around Lake Maurepas and Lake Pontchartrain.

In the 1870s, the LaPlace Plantation was named after Bazile LaPlace, a wealthy Frenchman who purchased the former Picou estate, and later the Thibaud and Perilloux Plantations. Bazile LaPlace died in 1885, leaving the large plantation to two of his sons, Bazile LaPlace, Jr., and A.J. LaPlace. In 1897, A.J. LaPlace gave up management to another brother, U. LaPlace, although he died in the last major outbreak of yellow fever in 1905. The plantation was then purchased by the Montegut brothers of the New Era Plantation. In 1916, LaPlace plantation was sold to Godchaux Sugars, Inc. (Laurent 1923:166).

The official foundation of the town began with the establishment of the post office. It was originally named "Eugenia" in honor of Eugenia LaPlace, the wife of Bazile LaPlace Sr. However, the name was changed to LaPlace since the residents more commonly referred to the plantation name. Within the confines of the town there were several smaller towns which sprang up around the main village of LaPlace. Mileville, located on the upriver side of LaPlace, was named for the first African-American to build a house there. Another, Furatville, was named after Gustave Furat, who also was the first to settle in that location. Cherokee Village was named for the number of Cherokee roses that grew annually in the area (Laurent 1923:167).

Although prosperous, the fledgling town of LaPlace did have its share of difficulties, including the crevasse of 1872. Despite this eleven-year setback, the town continued to grow and it is currently among the most rapidly growing cities in the state (Calhoun 1995:243). In addition to its sugar industry, other industries also participated in the economic development of the LaPlace area. The LaPlace Packing Company was purported to be one of the largest vegetable packing companies in the south (LA Dept. of Agriculture and Immigration 1925:207). Part of the the parish's economic success was due to the accessibility to major transportation lines. Three major railroad lines ran through LaPlace: the Yazoo and Mississippi Valley, the Louisiana Railway and Navigation Co., and the Mississippi River Sugar Belt line. Even before the advent of rail and trucking transportation, at least a dozen steamboat lines stopped at LaPlace as well, providing for the cheap transportation of sugar. These steamboat companies included the Ouachita and Red River Steamers, the New Orleans, Natchez, and Vicksburg Packet Company, the St. Louis and New Orleans Anchor Line, and the St. Louis and Mississippi River Transportation Company (Fortier 1914:44)

Reserve Plantation and Central Factory

Inextricably involved with the history of the Reserve area is Leon Godchaux, one of the most important figures in the economic and agricultural history of Louisiana. Leon Godchaux was born in Herbeville, Alsace-Lorraine, France in 1824, and died in New Orleans in 1899. He immigrated to New Orleans in 1840. He began his very successful commercial career as a peddler along the Mississippi River between New Orleans and Donaldsonville, and he soon opened a store in Convent. In 1844, Godchaux opened his first store in New Orleans, and he opened a second store on Canal Street in 1855. In 1860, Godchaux expanded his business dealings into sugar growing and processing, purchasing the "Reserve" plantation of Antoine Boudousquié.

Godchaux bought the Boudousquié plantation on the eve of the Civil War, which played havoc with the Louisiana sugar industry. Recovery after the war was not immediate, but despite the unsettled state of labor organization in the post-War period, the destruction or damage of sugar house machinery, and loss of plantation livestock and implements, many of the cane plantations nevertheless recovered. Weathering the Civil War, Godchaux's diversified business interests allowed him to expand his sugar-growing and processing activities after the conflict. Several developments affected the cane industry in the decades after the Civil War. Technological advances in cultivation practices--in drainage machinery, subsoil plows, and other implements--meant lands formerly considered marginal for cane growing could be put into production. In addition, land costs in the sugar region were lower than prewar levels. The ability to plant more extensively on old cane tracts, plus the much lower land costs after the war, meant that some plantations produced significantly more cane than before the war and began to grow in size.

Godchaux acquired other plantation tracts in St. John the Baptist Parish, including, Star, LaPlace, La Branche, and Belle Pointe plantations, plus several smaller farms between these larger tracts. In line with antebellum practice, each large plantation tract had its own cane mill. As plantation acreage grew after the Civil War, sugar houses also grew larger to grind increasing quantities of cane in the time available for harvest. In addition, there was already a trend by the early 1880s for large sugar houses to draw cane not only from their own plantations but also from surrounding small farmers. Godchaux came upon the idea of a "central factory" which would grind the cane of several farms more efficiently than could be achieved at smaller mills, and he is credited with beginning the impetus toward centralization of cane processing that produced a dramatic reduction in the number of mills in the Louisiana cane region.

The central factory system allowed an improvement in engineering and chemical expertise and consequently, improved output of processed sugar. However, the extent of field acreage that could be handled by a single sugar house was limited partly by difficulties in getting the cane to the sugar house quickly enough, particularly in wet weather. Improvements in conveying cut cane from the field to the factory solved this problem. As early as 1833, a few Louisiana planters began to utilize mule-drawn trams on portable tracks to speed up the hauling of cane from the fields to the sugar house. However, the improvement was marginal and not dramatic, since the strength of mules was limited, and it is not known how widespread this practice became. Steam locomotives, the logical next step after mule-drawn trams, seem not to have been utilized on plantation railways until the late 1880s, but the adoption of plantation railways was very rapid after 1890. These railways contributed to the rise of the central factory system by allowing a single sugar house to serve thousands instead of hundreds of acres of canefields. The growth in the number of sugar houses stopped. Instead, central factories continued to grow larger and more efficient, and money was invested in extensive rail systems to supply them with cane. Planters consolidated larger cane acreages on individual plantations principally because transportation of cut cane by rail allowed economies of scale to operate (Butler 1980:21-25). Between 1880 and 1900, individual plantations grew in size while the total acreage of cane grown in Louisiana also increased by 60 percent (Quaintance 1904:13).

By 1900, most central factory sugar houses had a rail system with two locomotives. Some plantations had five or six, and at the extreme upper end of the spectrum, up to 15 locomotives. The locomotives used on the sugarcane plantations were mostly built by the Baldwin, Cooke, Davenport, Dickson, Porter, and Vulcan Locomotive works. The locomotives varied between eight and 26 tons in weight, although most were in the 12 to 15 ton range. In 1910, a 10-ton locomotive cost an average of \$2,500, delivered to the plantation. Nearly all were narrow gauge railways; about three-quarters had tracks 36 inches wide. Cane cars carried from four to 20 tons of cane each. Each four-ton narrow gauge railway car carried as much cane as two four-mule carts or four one-mule tramway cars, further reducing labor and livestock requirements. In one run from field to factory, a plantation railway might carry as much cane as 100 mule-cart loads. The multiple locomotives and extensive track networks for plantation railways serving the largest sugar houses could cost over \$200,000 (Butler 1980:21-25, *passim*; Schmitz 1979:275). Central factories conveniently located on navigable waterways also sometimes used barges, towed by steam tugs, to move cane.

After the introduction of plantation steam railways in the late 1880s, there was a precipitous decline in the number of sugar houses in Louisiana. There were 905 sugar mills in Louisiana in 1887, 745 (82 percent) of them steam-powered, and 160 (18 percent) of them horse-powered. Between 1887 and 1900 nearly two-thirds of the sugar mills in Louisiana ceased to operate; only 307 mills remained in the state in 1900, all but three of them steam-powered (American Sugar Cane League 1939; Schmitz 1979:274; Butler 1980:12-14).

The ability to deliver increasing amounts of cane to the mill quickly on the plantation railroads reinforced a number of trends in sugar house technology. Mechanized sugar houses became industrial central factories utilizing improved versions of machines developed in the antebellum period. All steps of cane processing were developed to produce more and higher quality sugar. The introduction of macerators, pressure regulators, tandem units, and other features significantly improved the efficiency of milling. Whereas the antebellum mills were lucky to express 60 percent of the sugar content from the stalks (50 percent was more usual), by 1910 the Louisiana mills were extracting about 76 percent of the sucrose from the cane. Producing the maximum amount of sucrose per ton of ground cane in Louisiana was important in competing with tropically-grown cane, which had a higher sucrose content. The open steam-heated evaporators and clarifiers developed before the Civil War were improved, filter systems were modernized, and most importantly, newer and even better versions of the multiple-effect Rillieux vacuum pans became standard. The large Rillieux triple- and quadruple-effect vacuum-

pans produced better-grade sugar more efficiently than competing systems, and were manufactured by numerous companies, including the prominent firm of Edwards and Haubtman in New Orleans (Maygarden et al. 1994).

The crystallized sugar from the vacuum pans, mixed with molasses, was treated further before either sale as brown sugar or final chemical refining into white sugar. The chunks of cooled, crystallized sugar and molasses were broken up in mechanical mixers and then placed in centrifugal machines that removed the molasses. Both mixers and centrifugals had been introduced prior to the Civil War in the largest sugar houses. They were improved in capacity and efficiency and became necessary items in the central factories. The brown sugar from the centrifugals was the major consumer product of the Louisiana sugar plantations well into the twentieth century. As late as 1912, only about 28 percent of total Louisiana sugar production was sent to New Orleans or eastern seaboard cities for refining. By 1917, when Godchaux Sugars opened a bone-black sugar refinery at Reserve, white sugar made up 46 percent of Louisiana's total production. In 1929, the majority of Louisiana sugar production was still consumed as unrefined brown sugar (Schmitz 1979:274-275; Maygarden et al. 1994).

By the first decade of the twentieth century, the average capital stock of each of Louisiana's sugar factories was \$170,000, indicating how capital-intensive the sugar industry in Louisiana had become. Several of the central factories had become very large, and were appointed with all of the latest technology for cane processing. The largest of the early-twentieth century sugar factories was the Reserve sugar house of the Louisiana Sugar Company (later, Godchaux Sugars, Inc.). In 1907, the sugar house was valued at \$136,192, and its machinery at \$547,181. At least four other factories-- Elm Hall (another Godchaux property), Raceland, Adeline, and Sterling--each had buildings and equipment valued at over \$500,000. The large capital outlay required to build, maintain, and modernize a central factory reinforced a trend toward cooperative or private corporation ownership of sugar factories, and in some cases of the principal plantations supplying the mills. Godchaux's Reserve plantation, including its railroad, had total assets of \$1,700,000 (Schmitz 1979:275).

The central factories and the plantation railroads provided new opportunities for small, independent cane farmers and for cane-growing tenants. St. Mary Parish educator C.A. Ives described the cane purchasing arrangements of the central factories prevalent at the end of the nineteenth century:

Each day's delivery by the farmer was dealt with separately. The sugar content was sampled in order to determine how much sugar the day's delivery would produce. A complicated calculation then had to be made. The farmer was paid as many dollars per ton of cane as the raw sugar was selling for in New Orleans that day. For example, if raw sugar was selling for 3¢, 3½¢, or 4¢ per pound, cane was worth \$3.00, \$3.50, or \$4.00 per ton (Ives 1964:126).

The trend of increasing factory size continued in the twentieth century. In 1910, there were 200 mills operating in Louisiana. By 1916, the average sugar factory was grinding over 25,000 tons of cane in a season, the output of about 1,700 acres under normal yields. It was difficult for a single farm to efficiently organize this much acreage. By 1916, the majority of tonnage ground at Louisiana cane factories was purchased by the mills, and 85 percent of Louisiana sugar factories purchased at least some of the cane they ground. Typically, the larger the factory, the greater reliance on outside sources of cane. Only nine of the over 150 mills in Louisiana in 1916 purchased all of their cane. The trend was for the factories to purchase more cane as time went on and rely less on the production of their own plantations. By 1922, only 112 Louisiana sugar houses remained in use. In 1923, the Billaud Sugar Factory was the largest mill in the state and purchased all of its cane from 762 individual cane farmers within a 20-mile radius. Another large factory, at Alma Plantation, bought cane from 500 growers, served by its

own 13-mile railroad and by the regular Gulf-Coast Line. Three years later, during the height of the mosaic disease crisis, only 54 mills operated in Louisiana. Contrary to a belief that the number of sugar houses in Louisiana declined steadily after 1900, the revival of cane-growing following the introduction of P.O.J. cane caused the reactivation of a number of sugar houses; in 1930, 70 mills were operating in Louisiana. By 1937, there were 92 central factories in operation in Louisiana, and each ground an average of 57,000 tons of cane per year (the production of almost 4,000 acres). The growth in the number of factories was temporary; by 1939, the number of active mills in the state had decreased to 72 (American Sugar Cane League 1939:Schmitz 1979:274, 276-277; Butler 1980:12-14; Durbin 1980:84).

In the crop year of 1890, the Godchaux central factory at Reserve milled 14,463 tons of cane, producing 2,402,905 gallons of 73.4 percent juice, producing 1,466 hogsheads of sugar (1.8 million pounds), and 1,709 barrels of molasses. The Reserve fields were producing 17.99 tons of raw cane per acre (Bouchereau 1890). Into the World War II period, the Reserve Central Factory of Godchaux Sugars remained one of the largest in Louisiana. The daily grinding capacity of the factory was 3,000 tons, and its pre-World War II record seasonal total was 218,874 tons of cane ground in the 1937 crop year; of that total, 57,544 tons of the cane were grown on Godchaux Sugars, Inc. fields and harvested by some 850 workers. The remainder, 161,330 tons of cane, was purchased from outside growers. As of 1945, the Reserve Plantation railroad had 20 miles of track, one 26-ton and four 12-ton locomotives, and 267 double-truck 10-ton cane cars hauling company-produced cane and some of the cane of outside growers. Another two- to four thousand tons of cane was delivered to the factory by truck, with the balance from outside growers hauled by the Yazoo & Mississippi Valley Railroad (later the Illinois Central Railroad). By 1945, the Reserve Plantation was quite advanced in utilizing motorized equipment in cultivation and harvesting its more than 2,500 acres of cane fields. The Plantation had 13 Farmall tractors and one Fowler gyrotillage Diesel unit, six flame cultivators, three Thornton cane harvesters and one Thomson cane harvesters, one Lorain cane hoist and two Ford V-8 hoists, and 26 Thomson all-steel cane trailers for haulage by the tractors. Sugar production at the factory in the years 1941 to 1944 averaged 23 million pounds of raw sugar and 950,000 gallons of blackstrap molasses annually, while the refinery, which operated year-round, had a refining capacity of over 2 million pounds of sugar per 24 hours. The sugar processed in the refinery was not exclusively Louisiana product, but included raw sugar imported from Cuba, the Philippines, and Puerto Rico (Eyraud and Millet 1939:103; Gilmore 1945:156-158; WPA 1941:534).

During the World War II period, the community of Reserve had a total population of about 400 persons during non-harvest seasons. Most of these residents were affiliated with the Godchaux operations, making Reserve virtually a company town. Besides being a leader in the cane plantation "housing reform" trend in the early 1940s, the Godchaux company constructed playgrounds, a community center, swimming pool, tennis court, movie theater, baseball and football fields, and a dance pavillion for community use. The Godchaux family also were benefactors of St. Peter's Roman Catholic Church in Reserve, although the Godchauxs themselves were Jewish (Eyraud and Millet 1939:101; WPA 1941:534).

Drainage of Louisiana Cane Lands

Almost immediately upon their arrival in south Louisiana, European settlers began to alter the natural drainage patterns of the landscape. This was necessary not only to improve living conditions by providing drier residential surroundings, but on a much wider scale, for agricultural improvement. The inordinately high groundwater table in much of south Louisiana discourages root development of agricultural crops and encourages a number of plant diseases. A significant proportion, if not most, of the land brought into cultivation in historic times in the south Louisiana alluvial region would have been cleared and improved for growing sugarcane, although smaller areas of south Louisiana were brought under cultivation for subsistence agriculture and indigo growing during the colonial period and for other crops in the nineteenth

and twentieth centuries. Since cane grows best with the ground water level kept at approximately three feet below the surface, cane growing requires a great deal of drainage preparation and maintenance. Technical and scholarly literature concerning Louisiana historical archeology should consider the effects of drainage on landscapes, stratigraphy, and other characteristics of regional and local soils. Although this is a complicated subject, even a brief examination can provide information useful to an interpretation of historic Louisiana landscapes and their attributes. The following discussion focuses on the preparation and maintenance of drained land for cane culture, but by necessity will touch on related subjects, and a more comprehensive understanding of cane growing should inform a specific analysis of drainage.

In summary, the eastern and southern parts of the Louisiana region are characterized by Mississippi Alluvium First Bottom Soils, mostly formed by deposition of sediments by the Mississippi River and its tributaries during the Holocene epoch. Many distributaries (or bayous) radiate from these rivers, which in turn overflowed their banks and deposited material. Soil particles from coarse sands to the finest clays are carried in the Mississippi's rapidly moving current. Seasonal high water levels in the Mississippi River frequently overtopped the natural (or later artificial) levees, causing local or more extensive flooding. This flooding distributed various soil particles within the floodplain, the coarse sand particles usually deposited first, close to the banks. As the water spread, its rate of flow decreased and smaller soil particles were deposited. When the swamps were reached, the stagnation of the water allowed the finest clay particles to be deposited. In general, the process described above deposited lighter soils (composed of coarser particles) near the streams and heavy clay soils in the swamps, with an intervening zone of mixed soil. In the swampy areas, smaller or secondary bayous carried excess water to lakes and bays, which in turn emptied into the Gulf of Mexico. The alluvial region typically has a small slope from natural levee to backswamp, usually a decline in elevation of about three to five feet, and rarely more than eight feet (Morehouse 1910:431; Maier 1952:3-4; Goins and Caldwell 1995).

Soon after initial European settlement in the region, systems of artificial levees were constructed to prevent inundation of cultivated lands along the Mississippi and larger streams which carried overflow from it. Periodic flooding resulting from breaks (or crevasses) in the levees resulted in the cutting of a channel in the topsoil and the deposition of different material than had been deposited previously. The effects of crevasses and other variations in deposition are reflected in particular localities, and within the depth of cultivation a single agricultural field may be composed of two or more soil types. In the historic settlement period, virtually all transportation was by boat, and combined with the natural topography of the region, led to the long-lot division of lands. Residences were established near the stream banks, facing the streams, on the higher natural levees. The waterway was almost always considered to be at the front of the tract and the swamp at the rear, regardless of the cardinal points of the compass (Maier 1952:3-4; Goins and Caldwell 1995:9,11,33).

While a portion of natural levee lands eventually used for cane culture were cleared of their natural vegetation and put into cultivation prior to the widespread growing of cane, another very large proportion were cleared purposely to be used for cane. A subset of lands cleared of natural vegetation in the historic period also fell out of cultivation at various times, and were allowed to revert to natural vegetative succession processes. The initial clearing of natural vegetation on south Louisiana natural levee lands was a monumental undertaking, particularly when the settler lacked sufficient draft animals. This process has been detailed in a discussion by the current author contained in Lee et al. (2001). The usual methods of clearing virgin forest in the colonial and antebellum periods was to girdle the trees, which were felled when dead, and then to burn all wood and brush with the exception of wood retained for lumber. Stumps were burned or pulled out. Clearing fields to a point where regular row-crop agriculture could take place was a process that took several years. Draft animals obviously made this task somewhat less onerous, but the human labor involved in clearing virgin forest was still staggering. Only

after the Civil War did land clearing methods begin to change significantly. More efficient animal-powered stump pullers were developed in the late-nineteenth century, and at the end of the 1800s, steam powered "donkey engines" were adapted to land clearing. The development of dynamite in 1867 made possible the widespread use of explosives to help remove stumps. In the late-nineteenth century Louisiana cane region, animal- and steam-powered machinery was used to great effect to clear previously unimproved or marginal lands toward the backswamps, which then were drained effectively and brought under cultivation utilizing other new methods and machines. During the first third of the twentieth century, a greater array of power machinery, including improved excavation machines, tracked bulldozers, and more powerful internal-combustion tractors, brought land clearance methods into the truly modern period (Maygarden 2001; Ayres and Scoates 1928:248-273).

Ordinarily the cane plantation tracts required a levee along the stream frontage. As clearing of backlands was undertaken, levees were often built along the whole or part of the other three sides of tracts, in addition to the side fronting on a waterway. Typically the side and back levees were not as large or carefully constructed as the levees in the stream side. All vegetation would be removed from the levee alignment, the surface plowed, and one or more muck ditches two or three feet in width and about two feet in depth would be excavated the length of the alignment to alleviate seepage. The levees required frequent additions in the first few years to keep them a required height, unless built oversized in the first place, to allow for shrinkage. Levees raised by means of shovels and wheelbarrows shrank about one-fifth of their gross height after construction, and those constructed by wheeled scrapers shrank about one-eighth in height. Levees constructed with an excavation machine used in dry soil shrank approximately one-sixth, and in wet soil, about one-tenth of gross height was lost in post-construction shrinkage. Canals were usually excavated on the outside of the levee, with a berm left to prevent the spoil from sloughing back into the ditches and levees were usually sodded to prevent erosion. Increased seepage during times of high water damaged levees because of the more porous soil above the ordinary water level (Morehouse 1910:432-433).

Professional surveyors were not necessary to lay out cane field drainage systems since the relatively flat topography of South Louisiana greatly simplified the initial topographical survey work that preceded any drainage construction. However, even the most rudimentary practice of drainage required that some means be used to determine higher and lower areas of any field and the grade of a ditch bottom. Early tools for drainage work included a water level, which could be made on the farm. The water level worked on the same principal as a carpenter's level, but was mounted on a tripod. With the water level, a simple wooden span level was used to measure the fall of the ditch. The span level consisted of an "A"-shaped frame with the cross-bar graduated and a plummet, the angle of the hanging plummet line indicating the degree of fall. By the twentieth century a simplified surveyor's transit (or "farm transit") was likely to replace the water level, and the use of a surveyor's transit and stadia rod obviated the need for a span level. As the ditch was dug, its cross-section was kept consistent with a wooden drain gauge, which measured the depth of the ditch and its width at top and bottom (Klippart 1867:387-394; Powers and Teeter 1932:305-328).

Antebellum drainage efforts concentrated on surface drainage, consisting largely of the removal of storm rainfall, to the exclusion of subsoil drainage. Until the introduction of mechanical excavation devices, all field ditches and drains were excavated by hand with shovels. This truism provides little indication of the various tools and methods actually employed in digging drainage ditches. Of course, specialized shovels were used for specific tasks. The ordinary shovel, that is with a short curved shaft, "D" handle and round point, or the square-bladed spade, were the basic implement for breaking soil unless the drain was to be less than a foot or so in width. Long-handled, round-pointed shovels were used to remove light soil after it was turned up with a pick, pickaxe, or foot pick. Spades were also necessary to cut the bottoms of ditches. Spade heads could be in a variety of widths depending upon requirements. Long-

handled scoops with either flat or concave heads could be used to remove loose soil from the bottom of a ditch. Ceramic pipe drains were not used to any significant degree in the Louisiana cane fields, so the various specialized tools used to lay and clean ceramic pipe drains in fields were also absent (Klippart 1867:387-394; Russell & Erwin 1980:292-293; Morehouse 1910:437).

Emancipation encouraged innovation in plantation drainage methods, as it did in methods of cultivation, partly because of the greater cost of labor in the post-emancipation era. Technological advances in the post-Civil War period reduced the human labor involved in drainage work and also allowed formerly marginal lands to be brought into cane production. Thus, innovations in excavating machinery were among the important developments in cane agriculture during this era. Excavating machinery can be put in two broad classifications: dry-land excavators which operate from the surface of the ground, and floating excavators which operate from the water. Mechanical excavators (or steam shovels) were invented in 1838, but almost certainly none of these were applied to cane plantation drainage work until several decades after their development. The first technological advances to methods of construction of farm drainage were animal-drawn drag scrapers, which came into widespread use by the 1850s. The simplest of these was simply a steel pan or scoop with a cutting edge, a bail for attaching a team of horses (or mules), and handles at the rear to guide the scraper while loading and emptying it (Figure 3). In operation, the drag scraper picked up soil in the scoop by the operator lifting the handles while the team pulled the scraper forward. When a load had been collected, the operator lowered the handles and the edge of the scoop rose above the level of the soil and the scoop bottom slid along the ground, while the team hauled the scraper to the "dump" or area where it was to be emptied. In the later-nineteenth century, the ordinary No. 2 drag scraper weighed about 100 pounds empty, was drawn by two horses (or mules), and held from 1/7 to 1/9 cu. yards of dirt. Soil was taken from a ditch alignment or borrow area that had been plowed or the soil loosened with picks and mattocks. Usually one man performed the scraping and another drove the scraper to the dump, since the scraper could usually be filled faster than it could travel to the dump and return. A standard drag scraper required seven to ten trips from borrow area to dump per cubic yard of earth deposited, and each scraper could convey about 60 cubic yards in a 10-hour work day. Costs for working in heavy clay, as might have been encountered in the Louisiana cane region, were 25 or 30 percent greater than when working in lighter soils (Pickels 1925:379-380; Crandall and Barnes 1913:21-22).

The simple drag scraper was succeeded by refinements such as the Fresno scraper, which was similar but had a greater capacity and required less effort to operate (Figure 4). Drag scrapers were in turn supplanted by two-wheel scrapers (Figure 5), which had somewhat larger capacities, but more importantly, required only two draft animals (as opposed to the Fresno scraper's three or four) and allowed longer hauls of the load. Four-wheel scrapers (Figure 6) were soon developed, consisting of a steel frame mounted on two trucks, a large pan or bucket suspended by chains, and a mechanism for lowering and raising the pan and for dumping the excavated material. These animal-drawn implements greatly reduced the manual labor involved in excavating and maintaining ditches as well as in constructing levees. Wheeled scrapers were also adaptable to use with tractors. Even more complex and expensive were elevating graders (Figure 7), consisting of a plow and a belt conveyor, which could be drawn by animals or tractors and could excavate up to 100 cubic yards of earth an hour. Other variants were chain-and-bucket excavators (Figure 8) and wheel-and-bucket excavators (Figure 9). During the south Louisiana reclamation heyday of the first quarter of the twentieth century, ditchers mounted on caterpillar treads were widely used to construct drainage features on the trembling prairies (Figure 10) (Pickels 1925:379-385; Morehouse 1910:437).

The drag-line scraper became the most important excavating machine used for drainage work on the Louisiana cane plantations (Figures 11-14) in the post-World War I period. These were manufactured in both stationary and revolving or rotating types, although the latter were

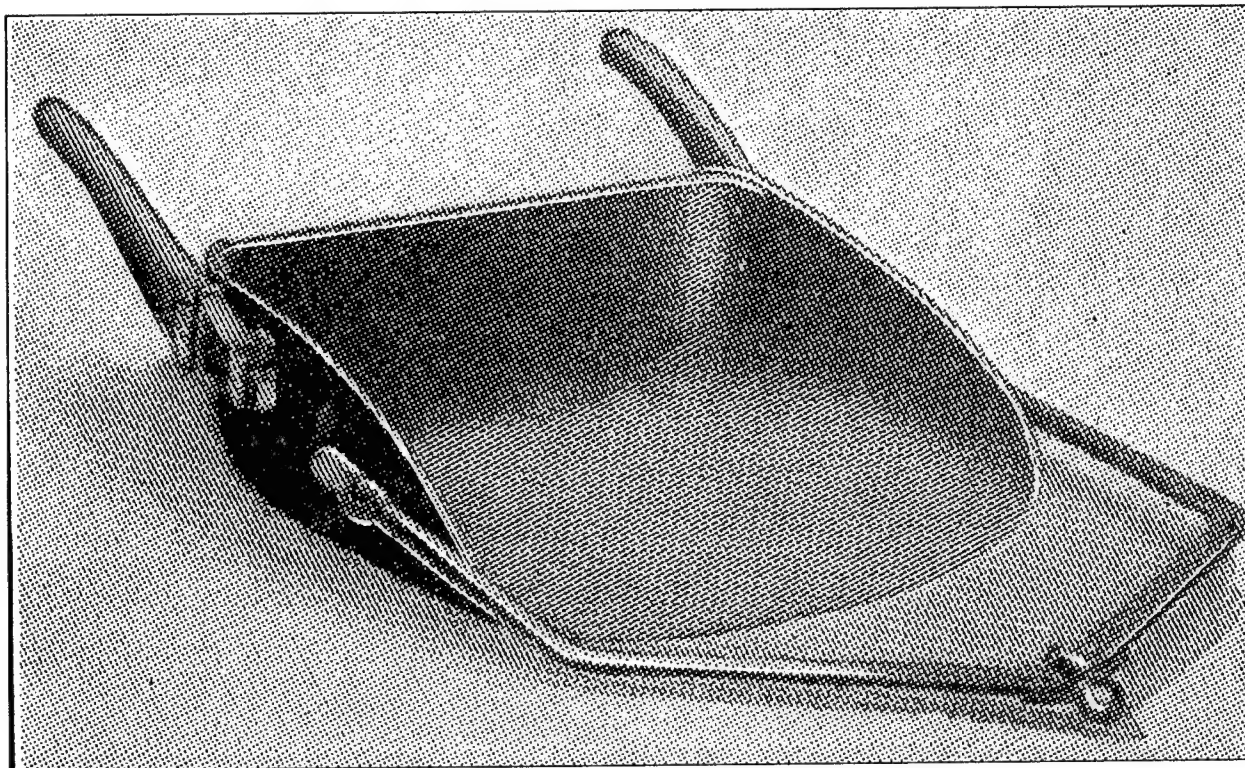


Figure 3. An early-twentieth century standard No. 2 drag scraper (from Crandall and Barnes 1913:21).

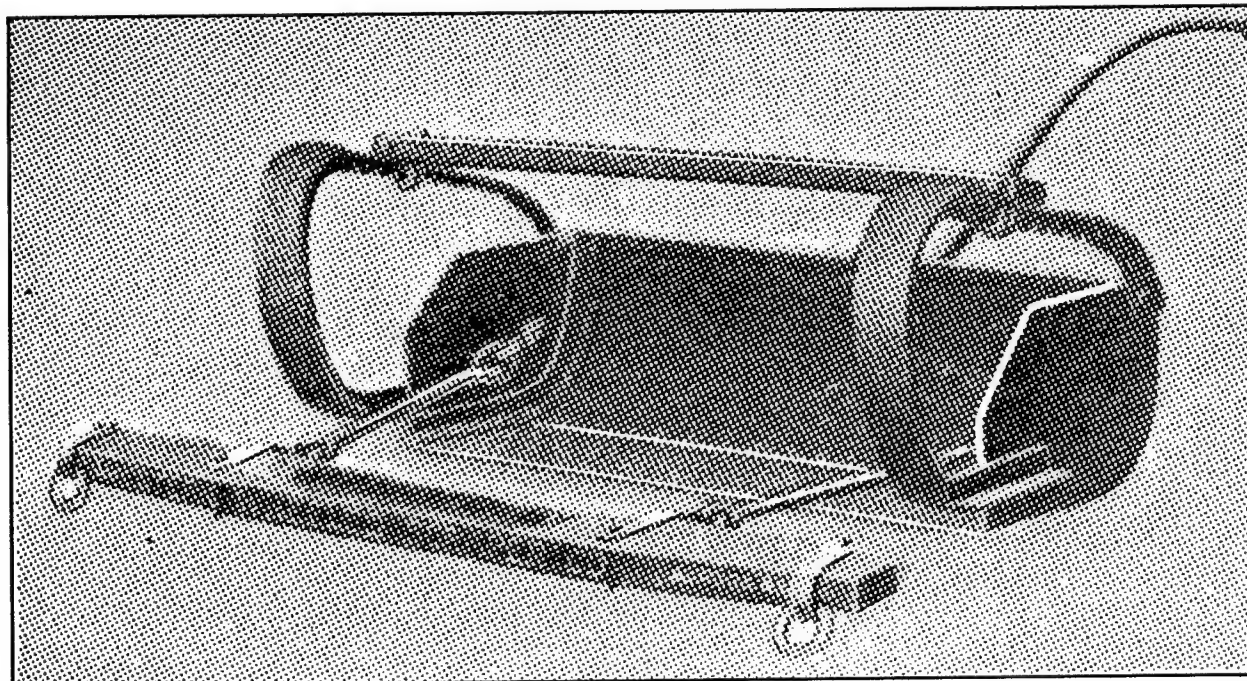


Figure 4. An early-twentieth century Fresno scraper (from Ayres and Scoates 1928:131).

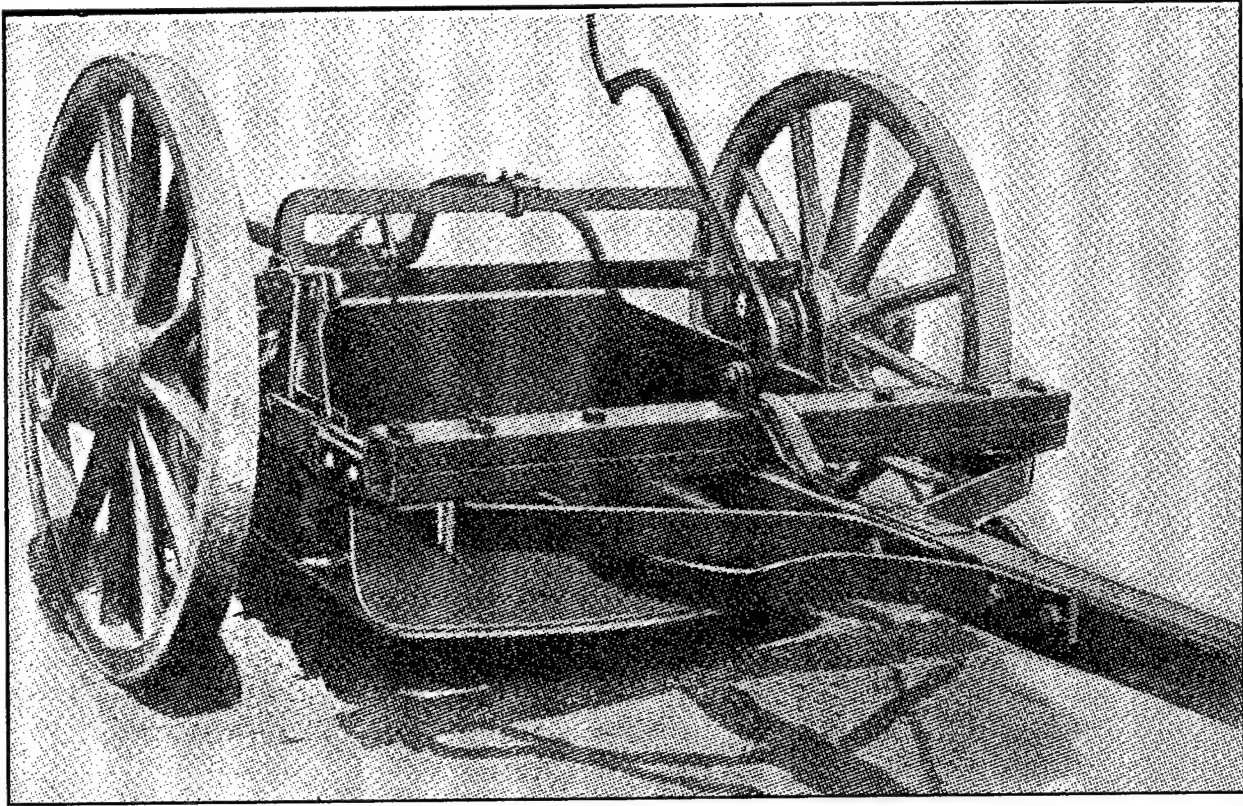


Figure 5. An early-twentieth century two-wheel scraper (from Ayres and Scoates:132).

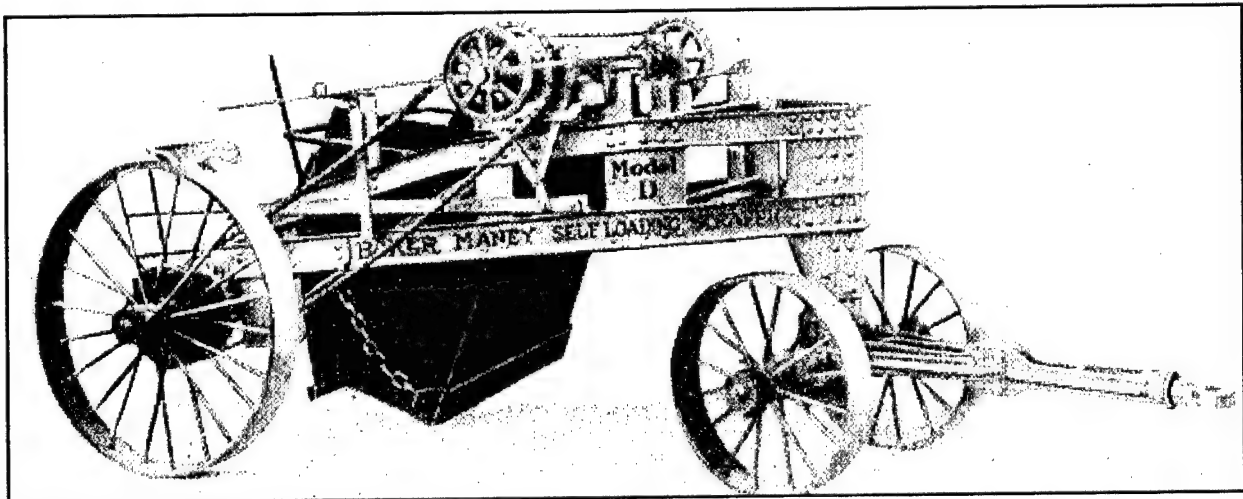


Figure 6. An early-twentieth century four-wheel scraper (from Pickels 1925:384).

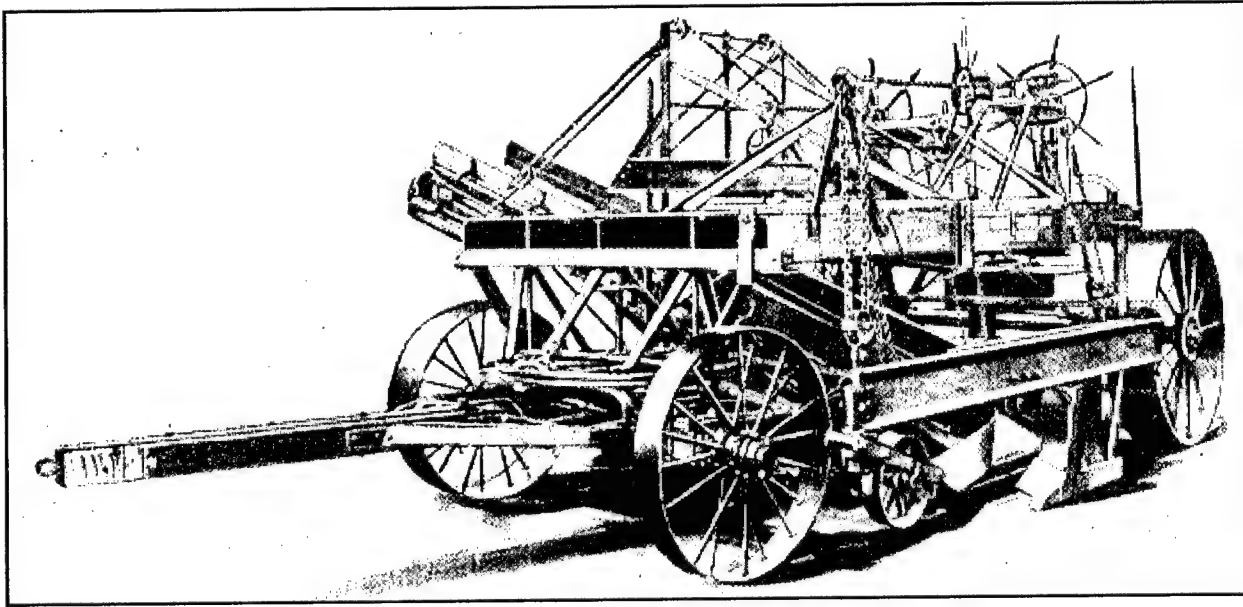


Figure 7. An early-twentieth century elevating grader (from Pickels 1925:385).

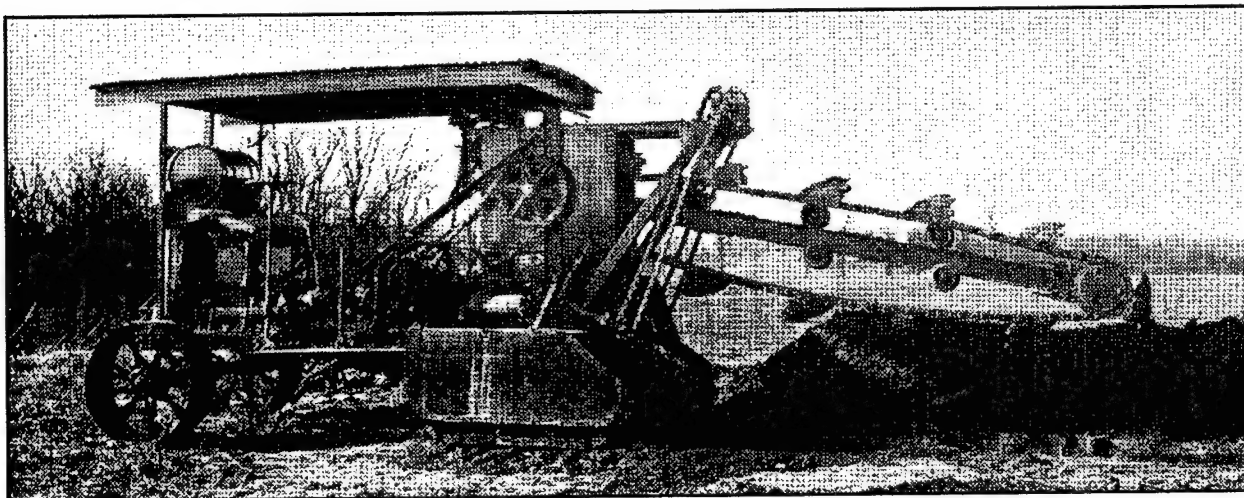


Figure 8. An early-twentieth century chain and bucket excavator (from Ayres and Scoates 1928:130).

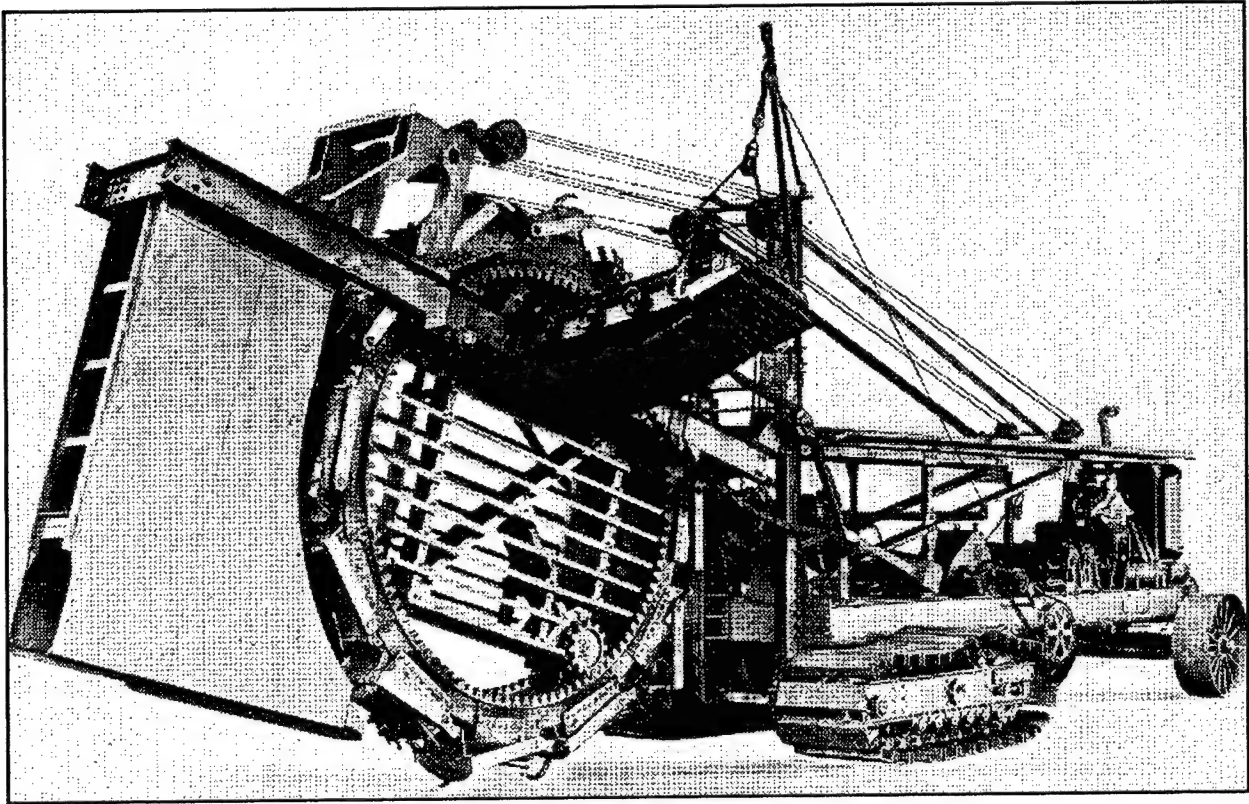


Figure 9. An early-twentieth century wheel and bucket excavator (from from Ayres and Scoates 1928:131).

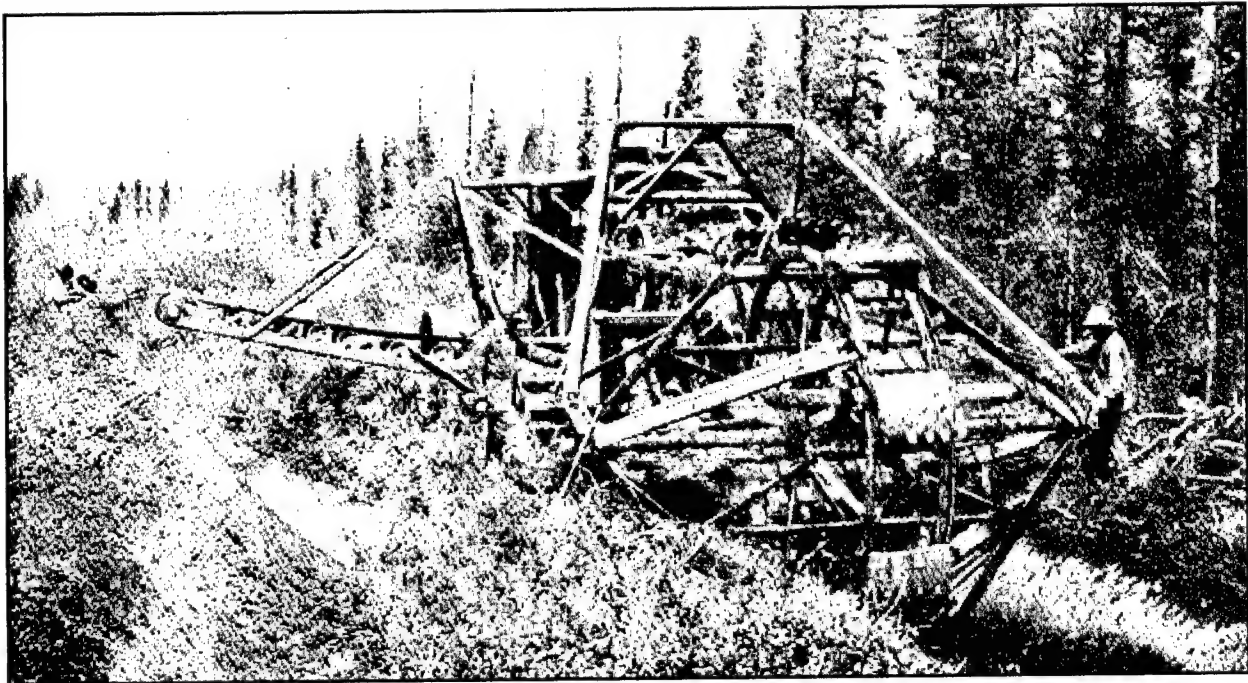


Figure 10. An early-twentieth century wheel excavator in use (from Pickels 1925:395).

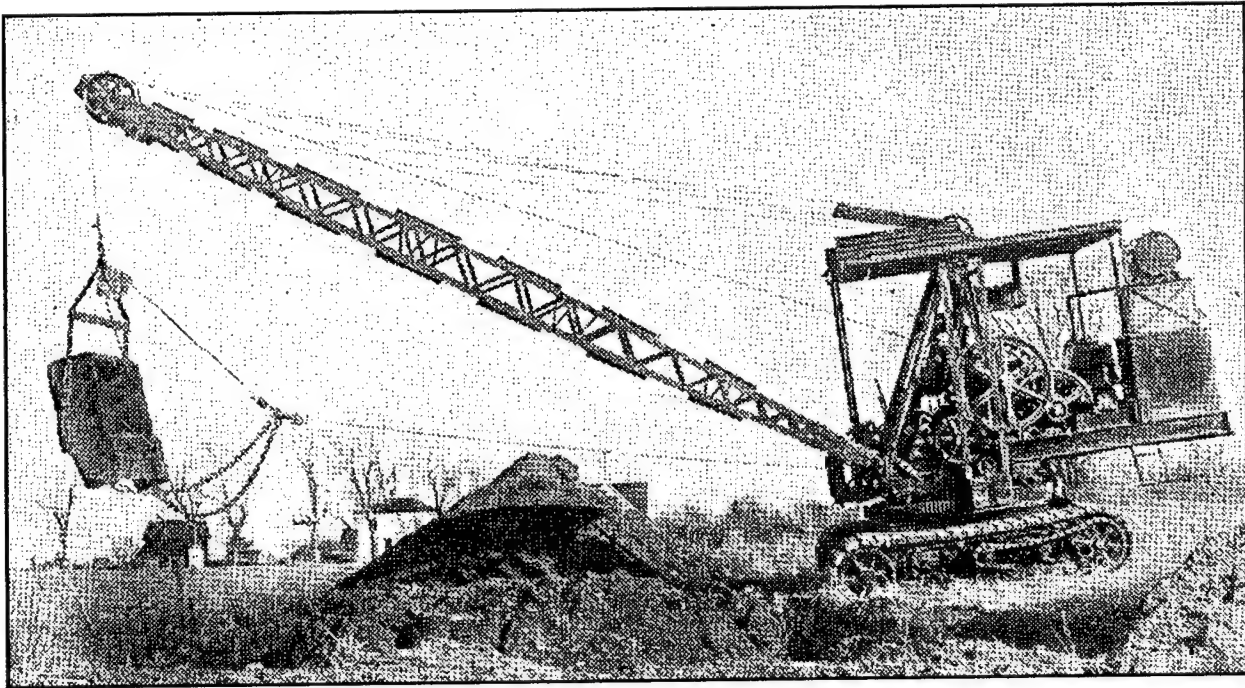


Figure 11. A small example of an early-twentieth century drag-line excavator (from Ayres and Scoates 1928:138).

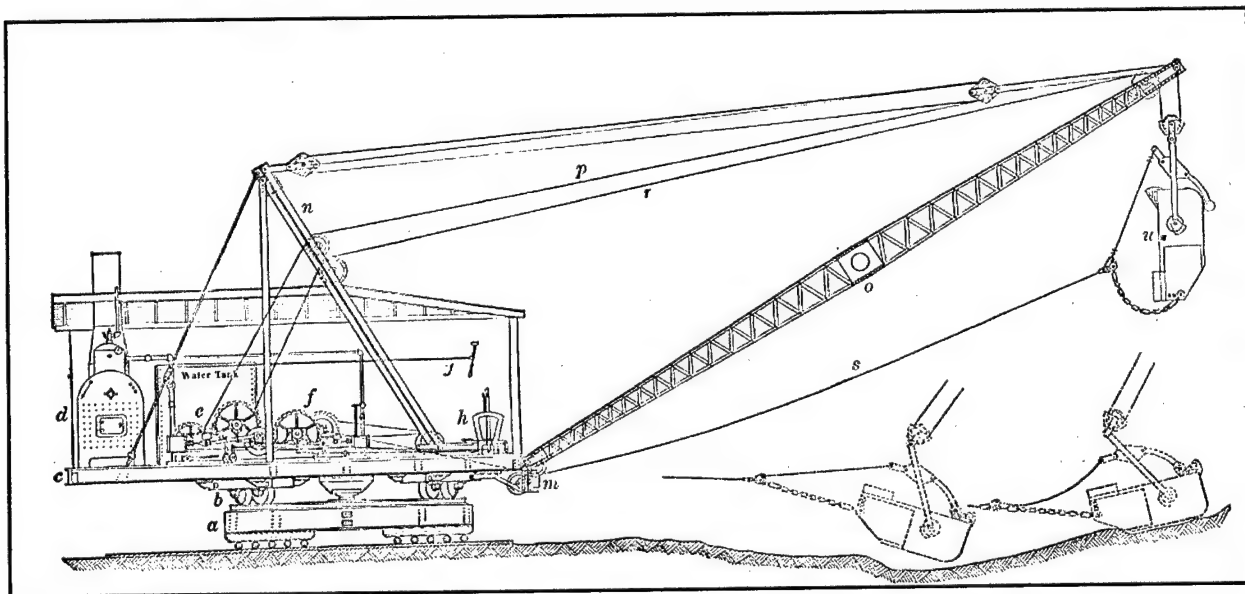


Figure 12. An early-twentieth century drag-line excavator (from Pickels 1925:386).

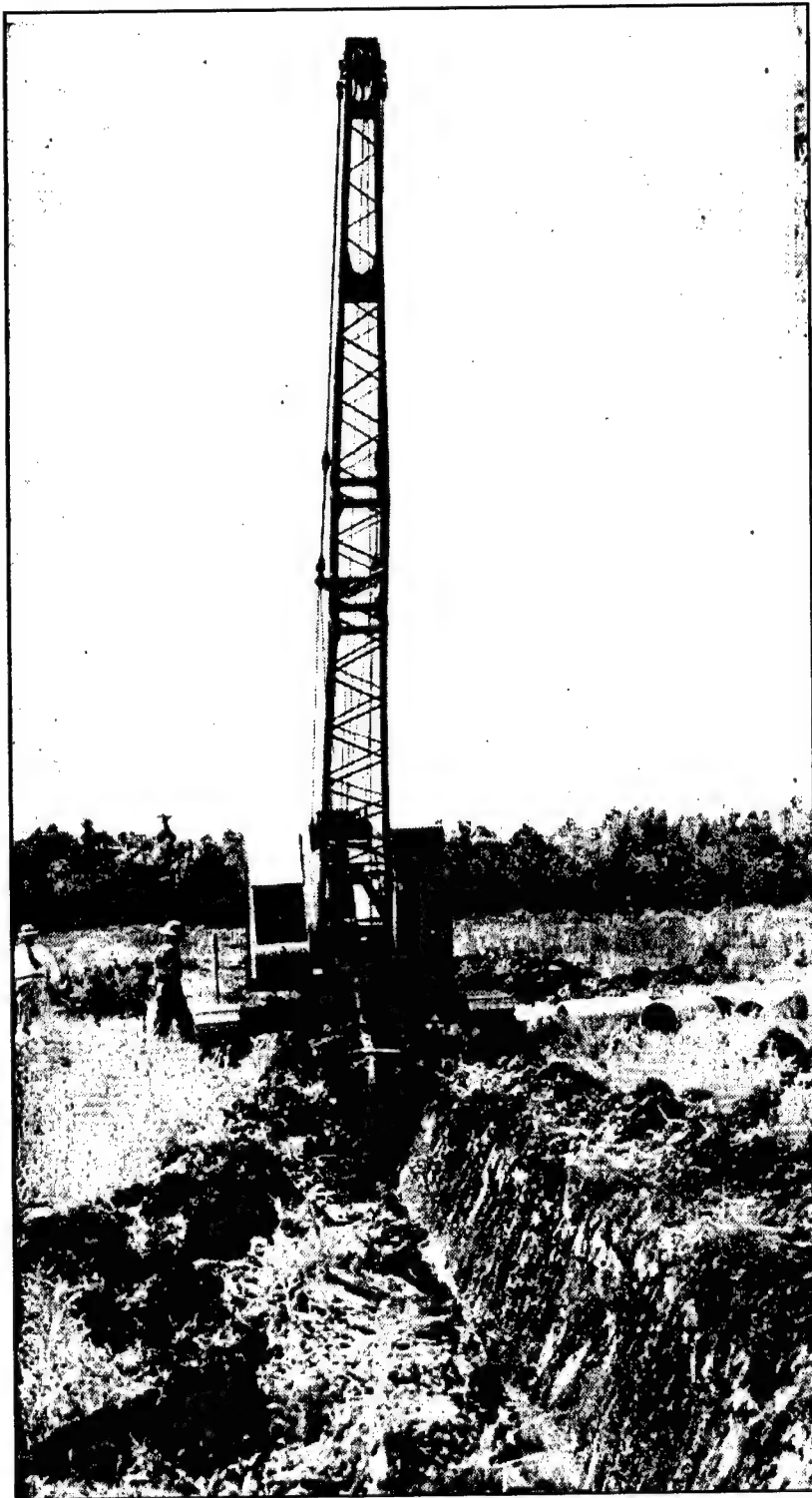


Figure 13. A mid-twentieth century drag-line P. & H. excavator constructing a lateral cane field ditch (from Maier 1952:5).



Figure 14. A mid-twentieth century Jackson Machinery Co. special ditching bucket designed for cane field use (from Maier 1952:5).

more commonly used. They were mounted on wheeled trucks, caterpillar tracks or treads, skids and rollers, or a special walking device for moving the excavator ahead. The earlier drag-line excavators were steam-powered, but by the end of the historic period usually were powered by diesel internal-combustion engines. By the mid-twentieth century, almost all medium to large cane plantations had at least one drag-line excavator. These machines had specialized buckets for maintaining the shape of cane field drainage ditches and were mounted on widely-spaced caterpillar treads to span the lateral ditches. During harvest season, the drag-line excavators were fitted with special grabs and did double-duty as cane-loaders (Pickels 1925:385-387; Maier 1952:4).

As drainage systems became more extensive and plowing technology improved, surface drainage was largely achieved by raising the cane plants nine to 14 inches above the middles (the area between the rows) by plowing up the middles and depositing the soil in the cane rows. The need for extensive ditching to keep the groundwater at about three feet or so below the surface, and other requirements of cultivating cane and transporting it during harvest, led to cane fields being rectangular, with the shorter dimension or width parallel to the stream and the longer dimension perpendicular to the stream. The cane rows also ran perpendicular to the stream. Typically, lateral ditches would run parallel with the cane rows. Each field had a number of intermittently-spaced ditches which ran at right angles to the cane rows, and ditches at each end of the field. The size of each field, surrounded by ditches, has varied significantly over time, but has become much larger with increasing mechanization (Figure 15). In the post-Civil War period (probably reflecting late-antebellum practice) it was usual to dig quarter drains every 120 feet (36.58 m) if the "leading" ditches were 480 feet (146.3 m) apart, and every 210 feet (64 m) if the leading ditches were 840 feet (256.03 m) apart. These leading ditches could be up to 1,200 feet (365.76 m) apart, and were usually six to 10 feet wide (1.83 to 3.05 m) and two to four feet (0.6-1.22 m) deep. Perpendicular to the leading ditches and from 800 feet (243.84 m) to 1200 feet (365.76 m) apart were "cross" ditches of a similar size. These ditches were dug with no fall, so that water could flow either way, depending on the height of the water in the leading ditches. "Panel" or lateral ditches placed about 90 feet (27.43 m) to 120 feet (36.58 m) apart also ran parallel to the leading ditches. These panel ditches were two to six feet wide and one at the top and one-half to three feet wide at the bottom. The panel ditches divided the fields into blocks or sections, known in Louisiana as "cuts". The cane rows ran parallel to the panel ditches, and every 300 to 400 feet (91.44-121.92 m), the furrows were crossed by a quarter drain, shallow shovel drains that carried the run-off from the furrows to the panel ditches. This array of ditches occupied from 10 to 20 percent of the cultivable area. Once the drains and ditches had been excavated, it was crucial to keep them clean throughout the growing season. On a 1,000-acre plantation, with maybe 40 percent of its total area in cane fields, in the hand-tool period at least two men were kept busy cleaning (or "plugging") ditches year-round except for the harvest season (Morehouse 1910:432; Maier 1952:4-6; Maygarden 2001).

Mechanical advances made deeper ditches easier to construct, improving subsoil drainage and allowing less of the total available area to be occupied by drainage features. From about 1910 to the end of the historic period ca. 1950, a single field unit increased from an average of about 16 rows six feet (1.83 m) apart to 18 to 25 rows six feet (1.83 m) apart, or a total width of from 100 feet (30.48 m) to a range of from 108 to 150 feet (32.92 to 45.72 m), with a lateral ditch on only one side, running parallel with the cane rows. Lateral ditches were commonly known as "two-foot ditches" by virtue of their average width at the bottom. The average width of the laterals at the top was three to four feet (0.9 to 1.22 m), and their depth two to four feet (0.6 to 1.22 m). Each field unit had three or four quarter drains which ran at right angles to the cane rows, and were spaced from about 170 feet to 250 feet (51.82 to 76.2 m) apart. The shallow "shovel ditches" or quarter drains were at right angles to the furrows and of various sizes, to lead the excess water from the middles to the lateral ditches. The cane rows were 500 feet to 1,000 feet (152.4 to 304.8 m) long, forming a unit of one-half to three acres. The units were arranged side-by-side so as to allow the lateral ditch to drain excess water from two field units, one on

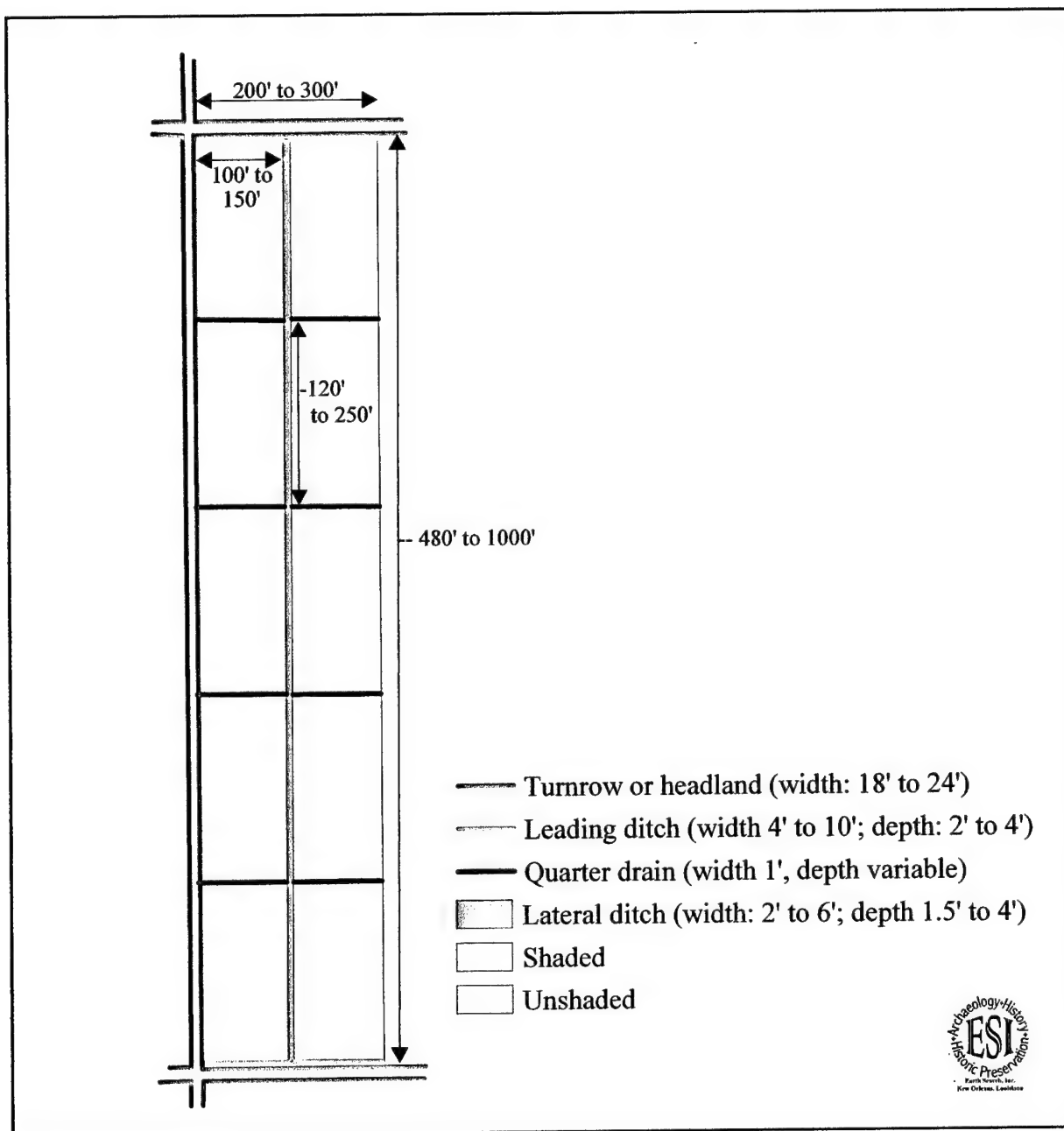


Figure 15. Schematic plan of two ideal cane field units, 1850-1950. Shaded area is one unit consisting of 18 to 25 cane rows, six feet apart, encompassing one and one-half to three acres. Ten to 15 units made up a sectoin or "cut" (Earth Search, Inc.).

either side. The laterals emptied into a "collecting" ditch, corresponding to the leading ditch, typically from four feet to 10 feet in width and four to five feet deep. Ten or 15 of these field units formed a section or "cut." Each cut was bounded by a headland or turnrow on each of the four sides, each headland measuring 18 feet to 24 feet (six to eight yards) wide. Groups of cuts formed "fields" of cane, and fields of cane comprised "plantations." At approximate intervals of 2,500 feet (833 yards), cross ditches from four to eight feet in width were placed at right angles to the lateral ditches. These cross ditches flowed directly into secondary bayous if possible, and if not, into specially excavated canals (Morehouse 1910:436-437; Maier 1952:4-6; Maygarden 2001).

The extent to which cane fields could be extended toward the backswamp of the plantation tract was limited by the decreasing elevation of the soil surface as the distance from the river increased. Eventually, a point was reached where surface water could not be made to drain by gravity because no fall was available between the soil surface and the standing water present in the backswamp during some or all of the year. Seasonal or periodic inundations could also occur from rising water behind the tract, perhaps as a result of storms, crevasses on another tract frontage, or on tracts adjacent to overflowing lakes. Several simultaneous developments occurred in the 1880s that made possible more extensive drainage features and therefore exploitation of the heavier soils toward the backswamps of the plantation tracts. These developments included improved earth-moving machinery, as mentioned above, and the adaptation of pumps to canefield applications. One solution to the drainage problem presented by the variable level of the backswamp was to protect the rear of the plantation by a levee. When the water in the backswamp was low, water could be drained from the fields and allowed to pass into the backswamp through floodgates in the levees. Obviously, this was not possible if the water level in the backswamp was higher than that in the fields, and in this case a pump was required to drain the water from the field, over the top of the levee. The use of pumps to remove water caused the plantation to be divided into two divisions. The areas with sufficient elevation for drainage features to work by gravity were in one division, and the areas where their drainage had to be accomplished with pumps were in another division (Figures 16 and 17) (Bouchereau 1883-1884; Wilkinson 1890:65; Pickels 1925:385; Maier 1952:3-6; Morehouse 1910:437).

Once cane fields had extended into former backswamp tracts, a pumping plant was usually located on the main reservoir canal. The first water-elevating devices in use in the cane fields were drainage wheels, a few of which may have been constructed in the antebellum period. These drainage wheels varied greatly in size, but in the post-Civil War period averaged about 30 feet (9.14 m) in diameter and five to seven feet (1.52 to 2.13 m) in width. A typical but hydraulically inefficient peripheral velocity of three to four feet (0.91-1.22 m) per second was maintained by steam engines, whereas at higher speeds less water was lost by reverse flow into the pit. Large foundations were required for these machines, and if the wheel fit poorly in its pit the efficiency was further reduced. Hollingsworth "water elevators" or pumps were patented in 1876 and had come into use in Louisiana cane and rice fields by the early-1880s. Other pumps by manufacturers such as Edward M. Ivens & Sons and Menge soon made their appearance for cane field drainage work. Belt-drive centrifugal pumps adapted to low lifts became the most popular cane field drainage pumps in the early-twentieth century. At this time pumps with impellers eight to 30 inches in diameter were typical, with 12-inch impellers perhaps most common. By ca. 1920, horizontal screw pumps better adapted to Louisiana conditions, developed by native New Orleanian A. Baldwin Wood ca. 1912, were introduced in field drainage systems. Louisiana drainage pumps had to function under changing heads because of heavy precipitation, and this was the *forte* of the Wood screw pump (Figures 18 and 19), an engineering marvel which performed its task with unparalleled efficiency and reliability. Power plants for pumping machinery varied greatly. Sometimes old cane mill boilers and steam slide-valve engines were used to power pumps, and were later replaced by more modern engines of various kinds. From the World War I period, vertical diesel engines were frequently utilized. Figure 20 shows a Wood screw pumping plant powered by Fairbanks-Morse vertical

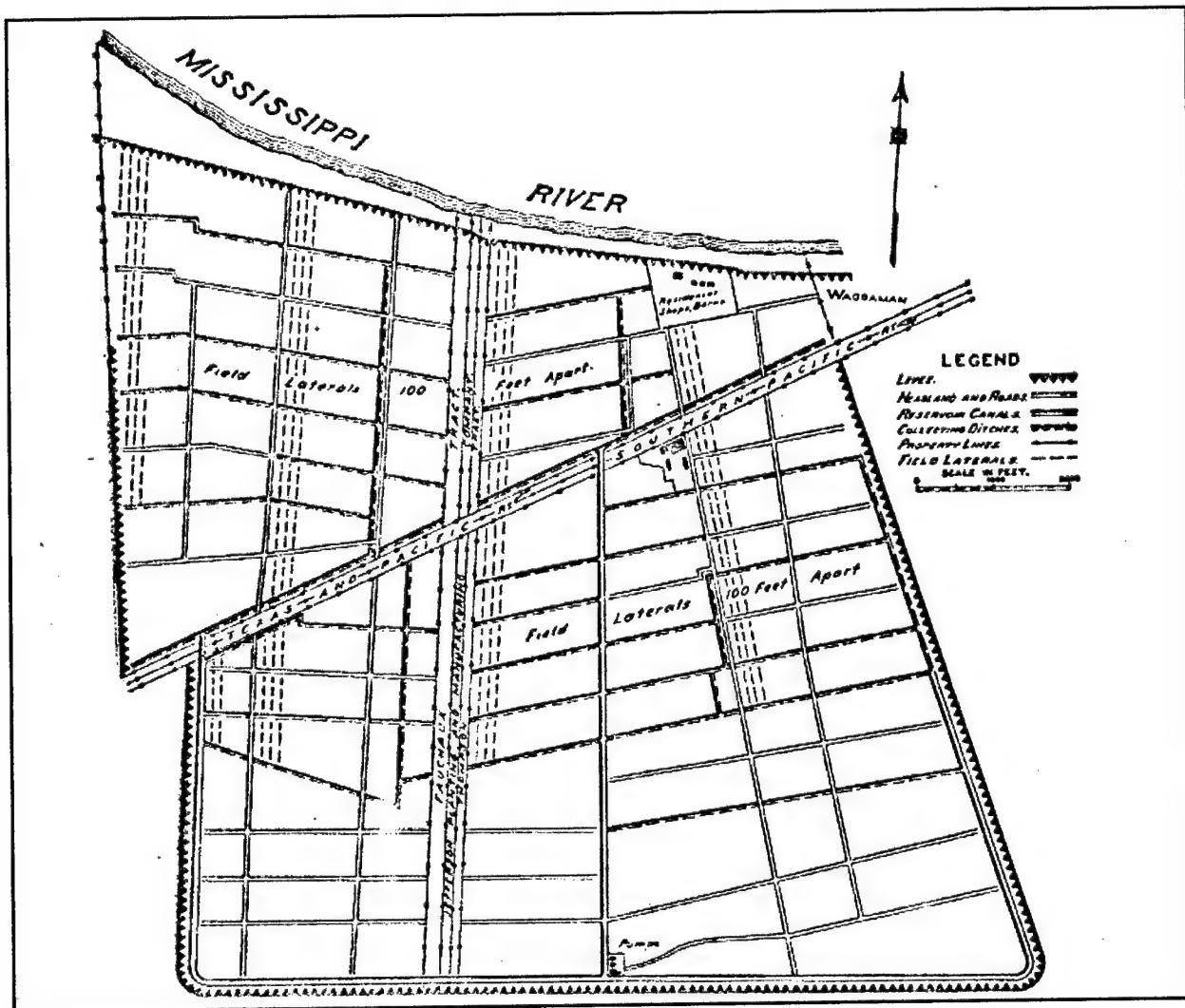


Figure 16. Map of Willswood plantation, Waggaman, Jefferson Parish, LA, showing ditch and levee system (from Morehouse 1910:420).

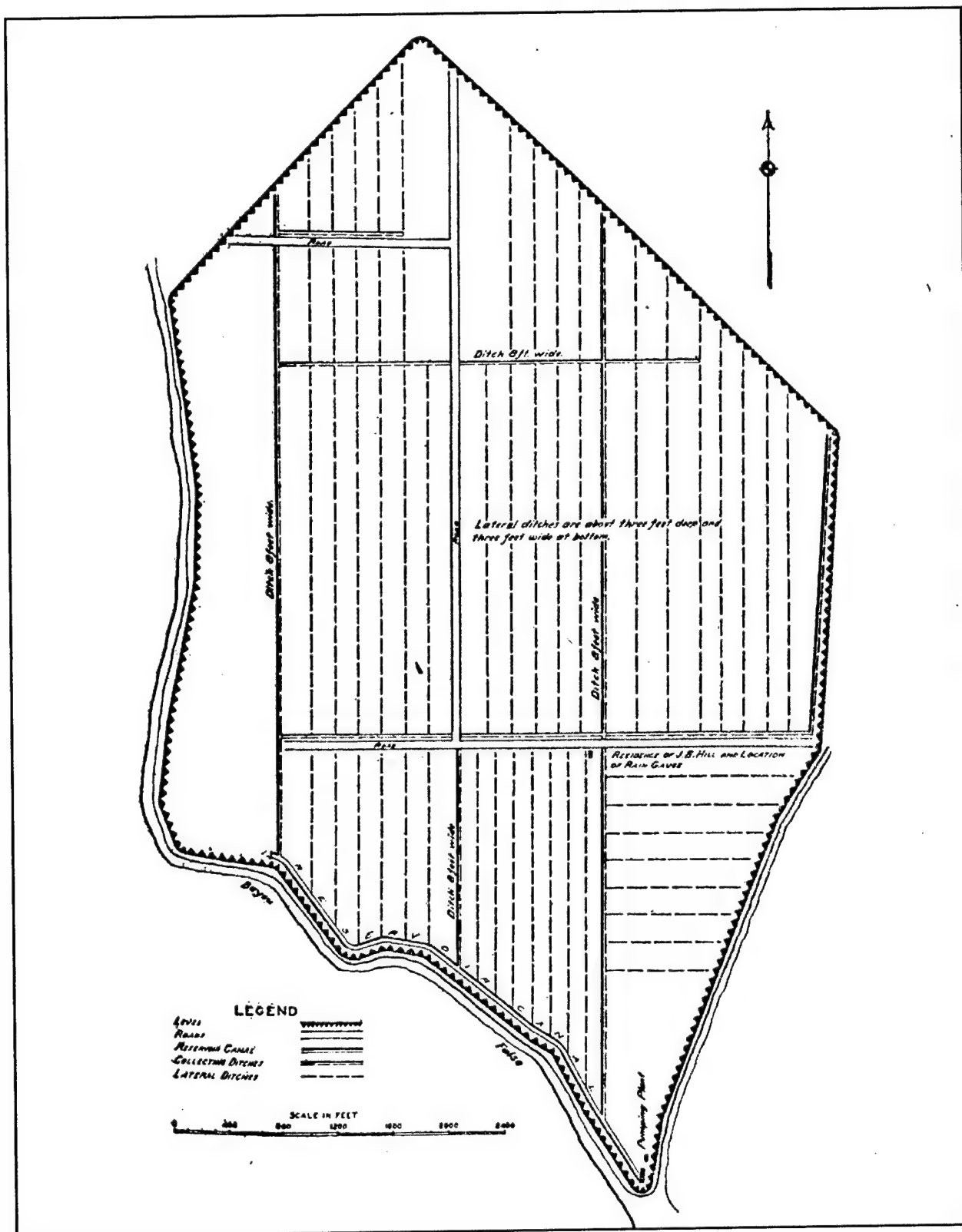


Figure 17. Map of drainage districts No. 2 and No. 3, near Raceland, La Fourche Parish, LA, showing ditch and levee system (from Morehouse 1910:423, 425).

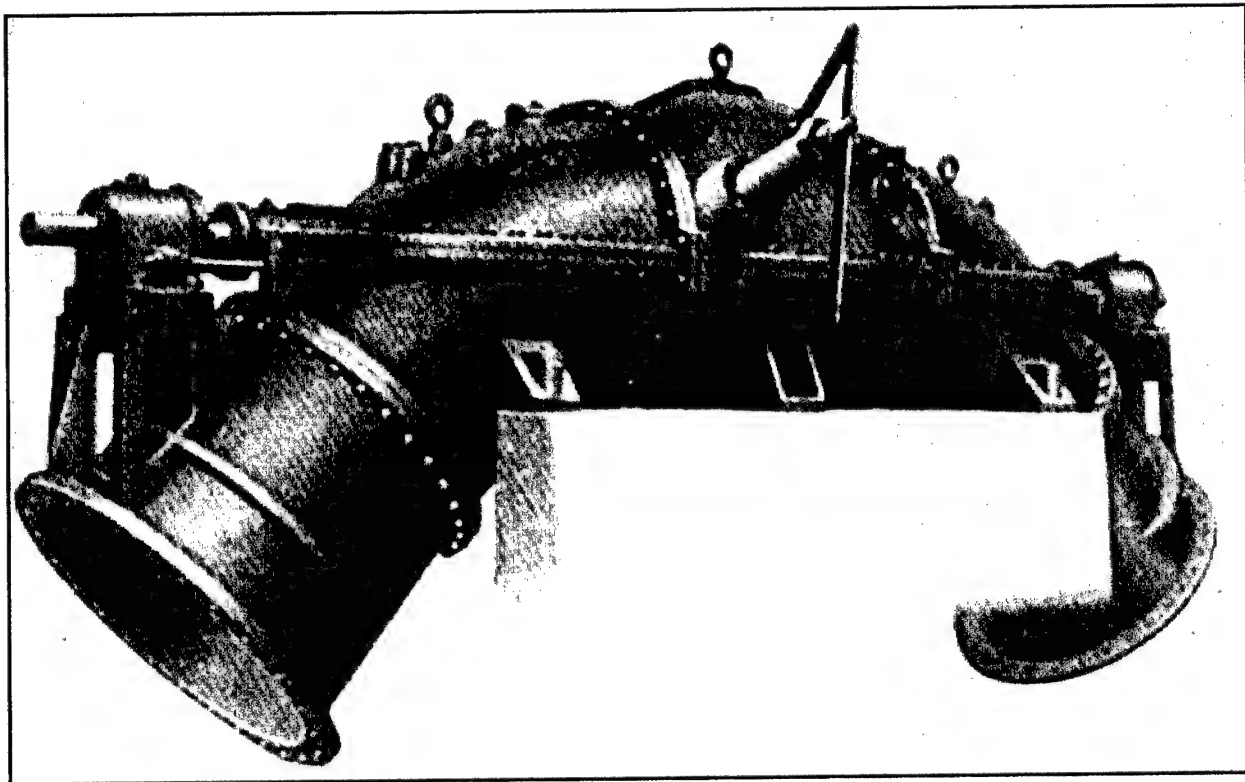


Figure 18. Wood Horizontal Screw Drainage Pump, ca. 1930 (from Etcheverry 1931:209).

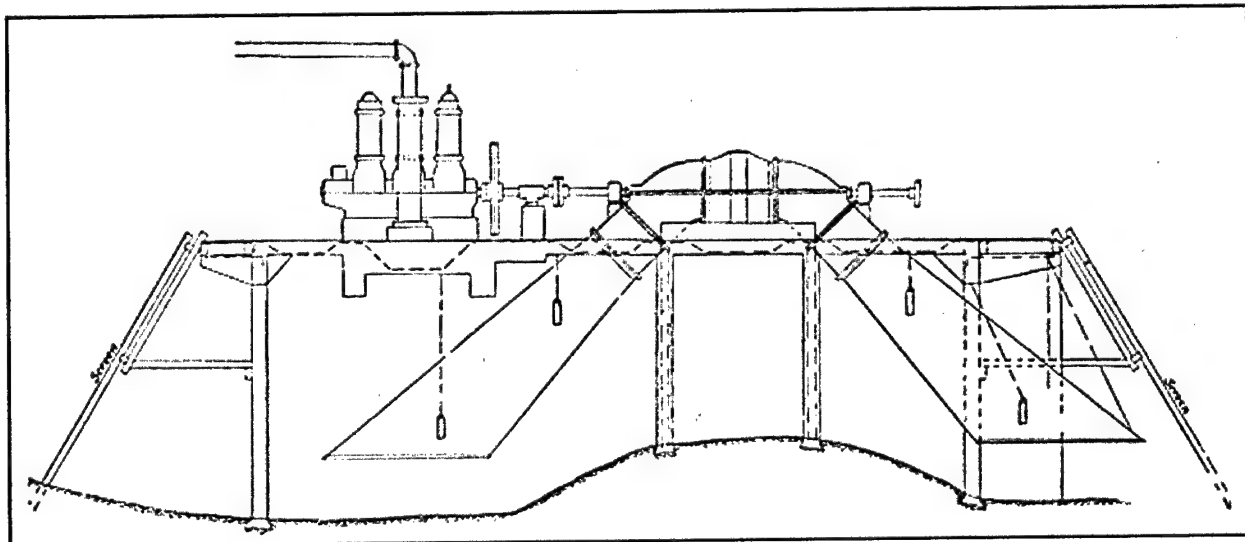


Figure 19. Cross-section of a typical low-head Wood drainage pump plant, ca. 1930 (from Etcheverry 1931:210).

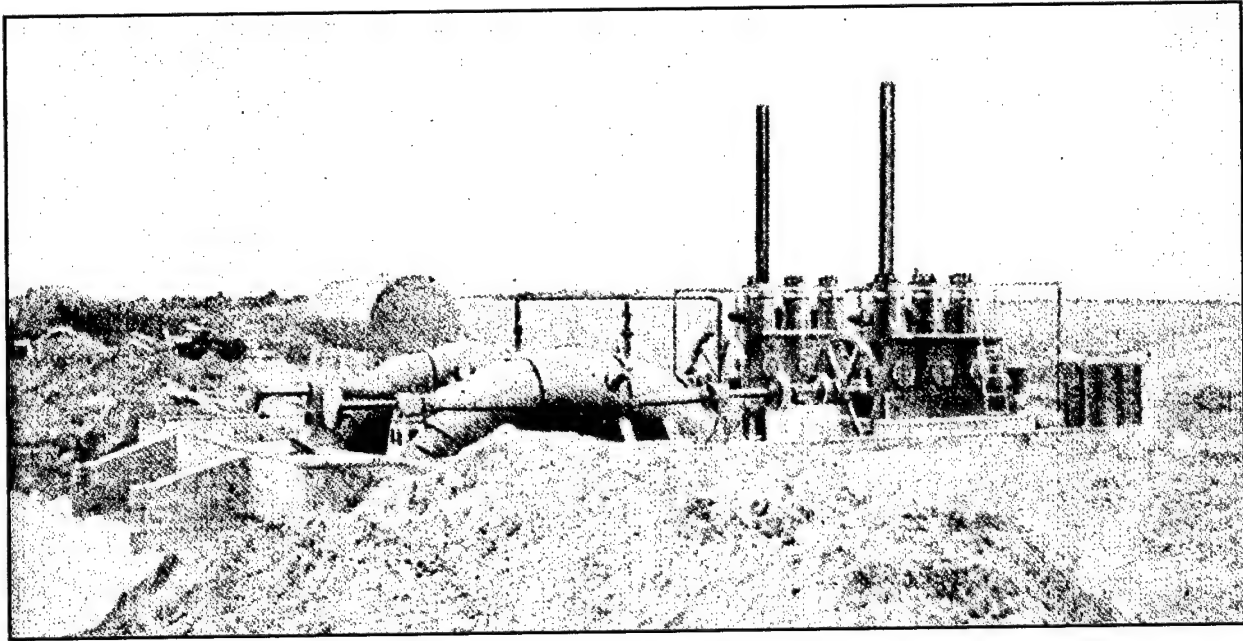


Figure 20. A Wood screw pumping plant powered by Fairbanks-Morse vertical two-stroke diesel engines, ca. 1930. The structure covering the pumping plant had not yet been constructed (from Etcheverry 1931:219).

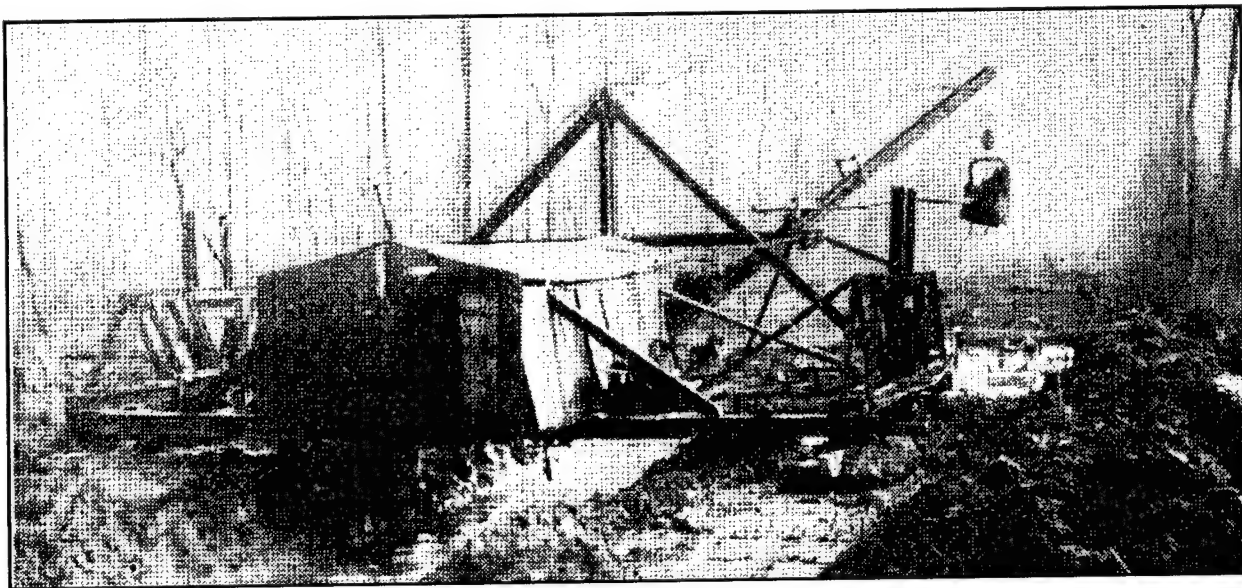


Figure 21. An early-twentieth century walking dipper dredge (from Ayres and Scoates 1928:135).

two-stroke diesel engines, ca. 1930 (Bouchereau 1883-1884; Wilkinson 1890:65; Pickels 1925:385; Maier 1952:3-6; Morehouse 1910:420-425, 439; Maygarden et al. 1999). If the plantation did not adjoin a suitable bayou or other outlet, outfall canals were constructed to carry water to suitable outfalls at secondary bayous. These canals, 20 feet to 60 feet (6.1 to 18.3 m) wide and five to eight feet (1.52 to 2.44 m) deep were expensive to construct, but their cost could be somewhat offset by the transportation opportunities they provided. As plantation tracts grew larger during the early 1880s, steam-powered dredges Figures 21 and 22 were adapted to plantation drainage work and were used to cut larger canals where required. The Menge patent dredge became the most common wet-land excavator used in the cane region for agricultural improvement. The dredged canals were relatively few in number until the south Louisiana wetland environment was transformed after ca. 1935, when petroleum exploration and extraction entered a period of rapid growth (Bouchereau 1883-1884; Wilkinson 1890:65; Pickels 1925:385; Maier 1952:3-6). By the early-twentieth century, water hyacinths had become a serious nuisance in the south Louisiana drainage canals and maintenance of the canals included routine removal of the hyacinths (Morehouse 1910:434-435).

Section B Pumping Facility

Prior to 1894, Leon B. Godchaux installed a drainage pumping facility at the rear of their plantation in T11S R6E, Section 32, probably powered by a steam engine. Circa 1913 to 1920, the steam engine were probably replaced with the diesel engine currently on the site. The pumps were probably also replaced at that time. The engine currently on the site (discussed in Chapter 6) is a Fairbanks-Morse vertical three-cylinder two-stroke cycle diesel engine. After some years of producing internal combustion engines that ran on various fuels, Fairbanks-Morse began production of deisel engines in 1912 and vertical diesels in 1913 (Figures 23 and 24). The example in the current project area probably developed 150 to 180 horsepower. The engine probably had a structure built around it for protection from the elements (Dick Gibbens, personal communication 2001; Ayres and Scoates 1928; Etcheverry 1931; Pickels 1925; Powers 1932).

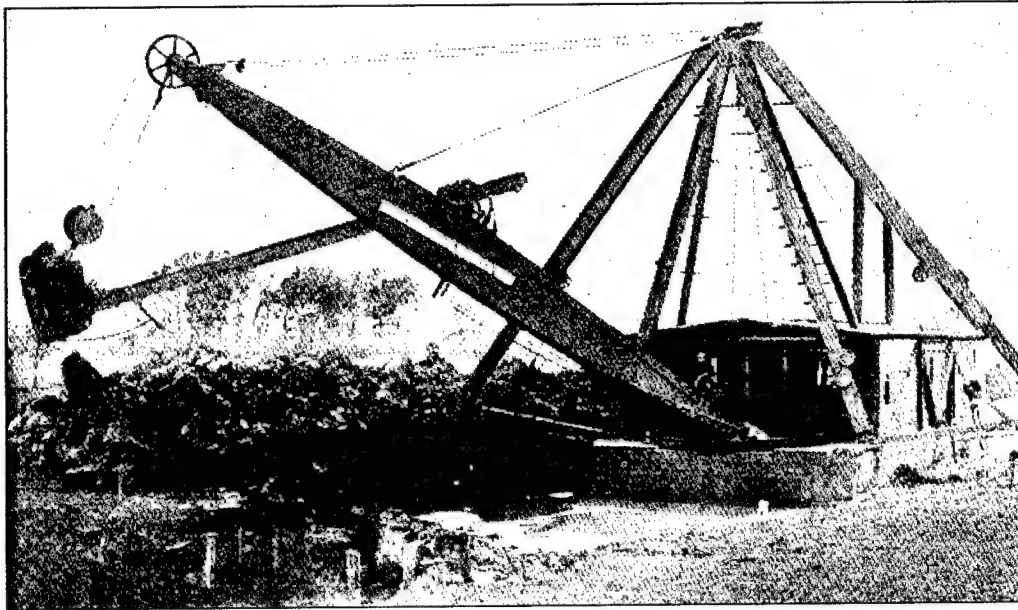


Figure 22. An early-twentieth century floating dipper dredge with telescoping support spuds (from Pickels 1925:398).

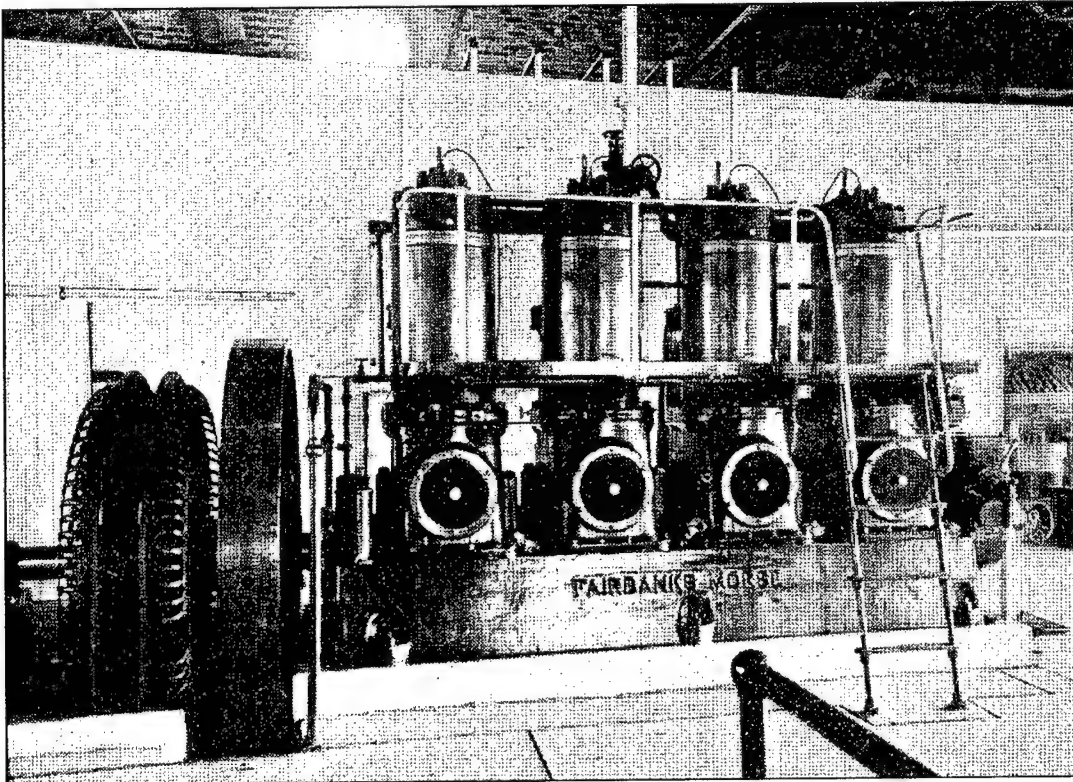


Figure 23. A Fairbanks-Morse Model 32 two-stroke vertical diesel engine (with four cylinders) powering a pumping plant (from Morrison 1939).

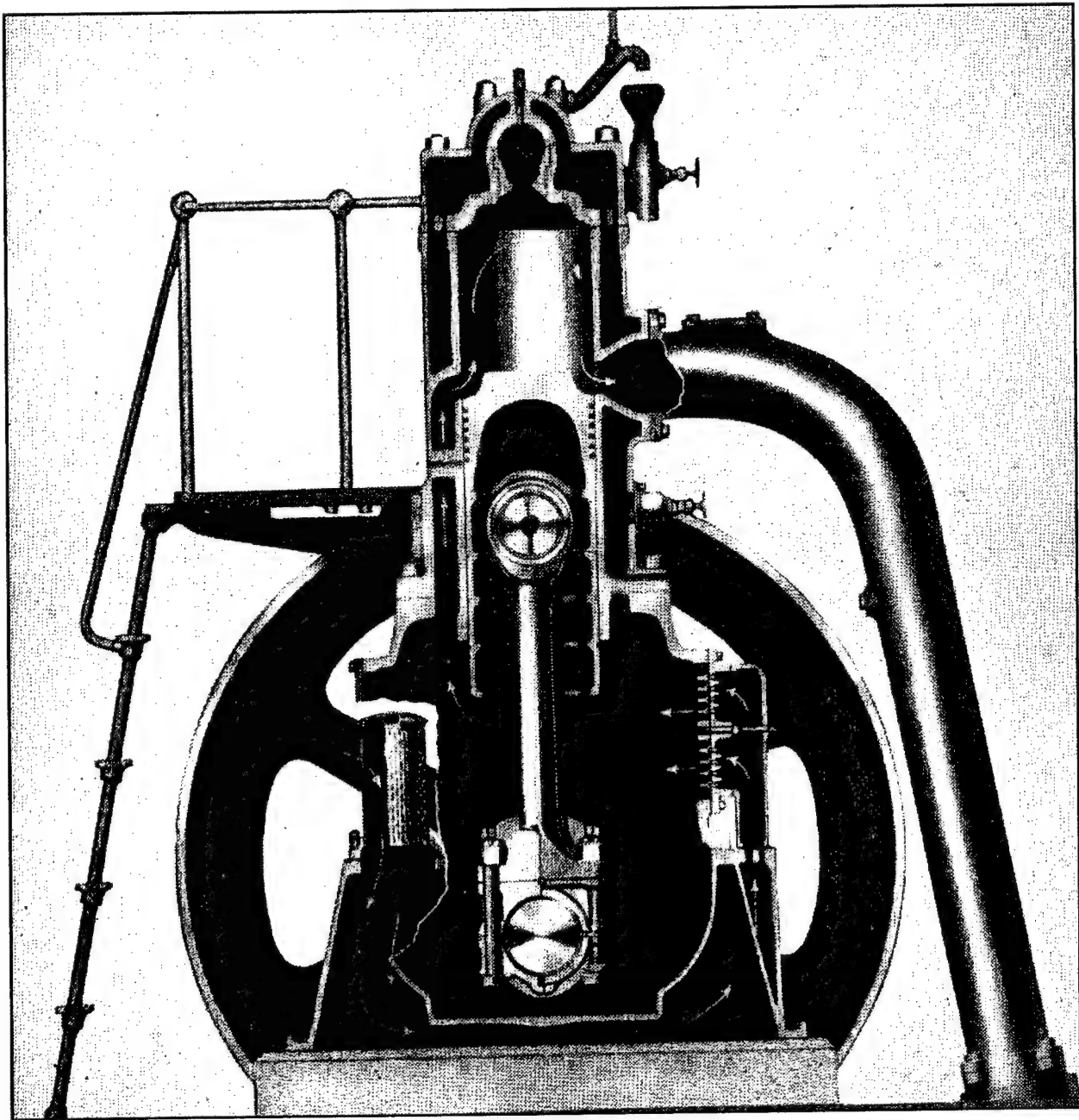


Figure 24. Cross-section of a Fairbanks-Morse Model 32 vertical two-stroke diesel engine (from Goad 1942:128).

CHAPTER 5

PREVIOUS INVESTIGATIONS

Prior to the commencement of fieldwork, background research was undertaken. This included an examination of the site forms and technical reports on file at the Louisiana Division of Archeology and a review of the historic standing structure materials at the State Historic Preservation Office in Baton Rouge, Louisiana. Research revealed twelve previous cultural resources surveys conducted in the vicinity of the project area. The archeological background and site file search revealed that no previously recorded archeological resources are located within the project area, although three previously recorded sites are located within one-half mile of the ROW. The historic standing structure search at the State Historic Preservation Office indicated that no historic standing structures were located within one mile of the project area.

Rivet (1974)

This intensive literature and pedestrian survey examined the site of the proposed I-10 interchange at the Eden Isles development in St. John the Baptist Parish, northwest of Bell Terre. No cultural resources were identified during the inspection.

Rivet (1975)

This literature and pedestrian survey examined the area to be impacted by the proposed 2 mi (3.2 km) long extension of Belle Terre Drive to the Reserve Relief Canal turnaround and I10 interchange northwest of Belle Terre. No cultural resources were identified during the survey.

Shenkel (1978)

Richard Shenkel conducted a literature and pedestrian survey of the 124 A (50 ha) to be impacted by the proposed St. John Parish Airport in St. John the Baptist Parish, north of US61 and the town of Dutch Bayou, Louisiana. Pedestrian survey focused on the one-third of the total area that was deemed high probability for archeological sites. The surveyed area consisted entirely of back levee and plowed fields. No cultural resources were identified during the survey.

McIntire (1979a)

Shell Pipeline Corporation contracted Coastal Archeology-Geomorphology to conduct this cultural resources survey along one leg of the proposed butadiene pipeline running from Norco to the Dupont plant near Reserve, Louisiana. The leg of the pipeline surveyed extended from the Dupont plant to the Big Three corridor, where it followed the existing Shell corridor through the LaPlace Oil and Gas Field and Bonnet Carre Floodway. Pedestrian survey of the proposed ROW consisted of shovel testing at 100 ft (30 m) intervals. No cultural resources were identified along the proposed corridor.

McIntire (1979b)

Shell Pipeline Corporation contracted Coastal Archeology-Geomorphology to conduct this cultural resources survey along a proposed Shell pipeline between Norco and the Marathon facilities at Garyville, Louisiana. The survey consisted of both literature and pedestrian investigations. Shovel testing was conducted at 100 ft (30 m) intervals along the corridor. No cultural resources loci were identified during survey.

Franks et al. (1986)

R. Christopher Goodwin and Associates, Inc. (RCG&A), conducted a cultural resources inventory of the town of Montz, St. Charles Parish, Louisiana. The study area extended 900 m (3000 ft) north of the Mississippi River. It was bounded to the east by the western guide levee for the Bonnet Carre Spillway and to the west by the Little Gypsy Power Plant. In addition to extensive archival and photogrammetric investigations, intensive pedestrian survey was conducted within the project area.

The survey identified seventy-four standing structures over 50 years old, although none were eligible for nomination to the NRHP. The survey also investigated the Montz Cemetery, which was established by 1935. It was determined that the cemetery did not possess sufficient integrity for nomination to the NRHP. No archeological sites were identified as a result of the survey. The standing structures and cemetery are located more than one mile outside the current project area.

Castille (1987)

The Landmark Land Corporation contracted Coastal Environments, Inc. (CEI), to conduct a Phase I cultural resources survey of 2400 A (1000 ha) of a proposed land development area in the backswamp along I10 north of Reserve. Intensive literature investigations suggested only one high-probability section of the project area located in the west along the Mississippi Bayou. Pedestrian survey and shovel testing was conducted in the area surrounding this stream channel. No cultural resources loci were discovered during the course of the survey.

Price (1987)

The United Gas Company contracted Heartfield, Price, and Greene, Inc., to conduct a cultural resources survey along a proposed 50-mi (80-km) natural gas pipeline replacement through Ascension, St. Charles, St. James, and St. John the Baptist Parishes. An historic records and standing structure search determined that no documented historic properties existed within the ROW. Intensive terrestrial survey and shovel testing at 60 m (200 ft) intervals identified fourteen cultural locations, including one site (16AN40), along the route. Site 16AN40 is a surface scatter of prehistoric ceramics within a plowed field with no subsurface integrity. It was determined ineligible for nomination to the NRHP. None of the cultural locations identified by Price are within one mile of the current project area.

Poplin et al. (1988)

RCG&A was contracted by the NODCOE to conduct a cultural resources survey of ten selected areas within the Bonnet Carre Spillway. The ten areas were examined using survey techniques contingent upon terrain and expected cultural resources yield. Intensive pedestrian survey and shovel testing examined three survey areas designated high-probability for historic cultural resources. Two survey areas designated high-probability for prehistoric remains, were examined by deep auger testing. The remaining five survey areas, all of which were previously disturbed, were examined through marine survey of the exposed bank line. No significant cultural resources were identified in any of the survey areas.

Moore and Moore (1992)

Moore Archeological Consulting conducted a cultural resources survey of 4000 ft (1200 m) of pipeline along a 75-ft (22 m) wide ROW in St. James and St. John the Baptist Parishes. Pedestrian survey and shovel testing of high probability areas along two parallel transects discovered one early-twentieth-century trash scatter (16SJ56). The site was determined to be ineli-

gible for nomination to the NRHP. No cultural resource locations were identified in the Pontchartrain Survey project area.

Robblee et al. (1998)

From November 1997 to June 1998, RCG&A conducted a Phase I cultural resources survey, inventory, and assessment of a 78 km (46.8 mi) segment of the proposed 159 km (95.4 mi) Koch Pipeline Southeast, located within the Pascagoula Pipeline Project corridor in Assumption, St. James, St. John the Baptist, St. Charles, and St. Tammany Parishes. Fieldwork consisted of pedestrian, airboat, and swamp buggy survey, as well as subsurface testing and architectural survey. Cartographic and archival research was also conducted. Twelve archeological sites (16AS48-16AS56, 16SJ59, 16SC31, 16SC78), two isolated finds, and one standing structure older than 50 years were identified during the course of field investigations.

Nine of the archeological sites identified during the survey were historic. The remaining three contained both historic and prehistoric remains. Two of the sites, 16AS49 and 16SC31, contained intact deposits and were eligible for nomination to the NRHP. The other archeological sites and historic structures were considered ineligible for nomination to the NRHP. None of the cultural resources identified by the survey are located within one mile of the current project area.

Lee et al. (2000)

ESI conducted a Phase I archeological survey of Entergy's Little Gypsy to Madisonville, Louisiana, power line. Pedestrian and airboat survey along the 11.75 mi (18.8 km) long, 60 ft (18 m) wide easement discovered one previously unidentified site, 16SC79. Subsurface testing of the low-density site exhausted research potential. The site was not eligible or potentially eligible for nomination to the NRHP. No other cultural resources were discovered over the course of the survey.

Archeological Sites in the Vicinity of the Project Area

16SJB58. In February 1994, Joel H. Watkins documented site 16SJB58, located west of the West 19th Street and the Kansas City/Southern Railroad intersection, south of US61 in Reserve. The site is a 10 m x 10 m (33 ft x 33 ft) light-density historic artifact scatter, consisting of ceramics and brick. Survey methods were limited to surface collection. The site is presumed to be part of a farm or rural residence. At the time of identification, the site had already been heavily impacted and was determined to be ineligible for nomination to the NRHP (LA State site files).

16SJB59. In February 1994, Joel H. Watkins documented site 16SJB59, located east of the West 19th Street and the Kansas City/Southern Railroad intersection south of US61 in Reserve. Surface collection of the light-density scatter recovered historic ceramics, glass, and brick. The site is presumed to be part of a farm or rural residence. At the time of identification, the site had already been heavily impacted and was determined to be ineligible for nomination to the NRHP (LA State site files).

16SJB60. Joel H. Watkins documented site 16SJB60 in February 1994. The site is located 70 m (231 ft) east of the West 19th Street and the Kansas City/Southern Railroad intersection south of US61 in Reserve. Surface collection of the light density scatter recovered possible historic brick. The site is presumed to be part of a farm or rural residence. At the time of identification, the site had already been heavily impacted and was determined to be ineligible for nomination to the NRHP (LA State site files).

CHAPTER 6 FIELD INVESTIGATIONS

High Probability Areas

Two portions of the proposed project area were determined to be high probability for possible cultural resources based on background research and geoarchaeological considerations. Both these areas were designated high probability based on the intersection of natural waterways and their associated natural levees with the proposed ROW. Area A is a 1.4 km (0.9 mi) section of ROW extending through Sections 76, 77, 78, and 100, T11 R7E. One meandering stream channel and one artificially straightened canal intersect the ROW in this area. Area B is a 1.4 km (0.9 mi) section of ROW within Section 57, T11 R6E.

Methodology

Archaeological survey, consisting of ground surface examination and shovel and/or auger tests, was undertaken within the two high probability areas. Investigations within Areas A and B were conducted at 30 m (98 ft) intervals. In open fields with better than 60 percent surface visibility, the ROW was visually inspected. All other areas were subjected to systematic shovel testing. Shovel tests were 30 cm (12 in) in diameter and were excavated to sterile subsoil or to a depth 50 cm (20 in) below surface (cmbs). Auger test probes were excavated in the bottom of shovel test to a maximum depth of 2 m (6.4 ft). Excavated soil was screened through ¼-inch wire mesh where possible, while denser soils were carefully trowel-sorted. The soil characteristics and stratigraphic associations of a representative number of shovel and/or auger tests were recorded. Photographs of the survey areas, both in black and white prints and color slides, were taken as appropriate.

Results

Beginning at the survey baseline in Area A, a wide drainage canal flows along the southern toe of the existing levee for 760 m (2493 ft) (Figure 25). Following the termination of the canal, and for the entire length of Area B, survey consisted of two transects spaced 5 m (16 ft) and 30 m (98 ft) south of the toe of the existing levee. In both high probability areas, two additional parallel transects were surveyed 30 m and 60 m (98 and 197 ft) to the north of the existing levee.

A total of 164 shovel/auger tests were excavated within Area A and 180 in Area B. Stratigraphy in both areas consists of 10YR 5/1 (gray) to 10YR 5/2 (grayish brown) stiff, moist, slightly silty clay mottled with oxidized concretions. Below 50 cm (20 in), this clay graded into 2.5YR 6/1-5/1 (reddish gray) stiff silty clay with increasing water content (Figure 26). No cultural resources loci were identified as a result of subsurface testing.

A circa 1920 Fairbanks Morse diesel engine was noted adjacent to a drainage canal east of the St. John the Baptist Parish airport in Area B (Figure 27). Clearing brush and poison ivy from around the engine and engine mounts revealed a flat brick foundation located to the east of the engine. The northern face of this foundation is visible within the drainage canal. The northeast and northwest corners of the foundation could be cleaned. There is evidence of an addition to the northwest corner, where a seam is visible. The corners do not match, which also suggests an addition to the northwest corner. A wooden post appears immediately west of the foundation. The southern portion of the foundation is obscured by fill and by road construction, and soil probing did not encounter evidence of the foundation. The two large machine mounts south of the engine are of brick and cement construction with a cement veneer. They appear to be the same type of bricks as those in the foundation and may have been scavenged.

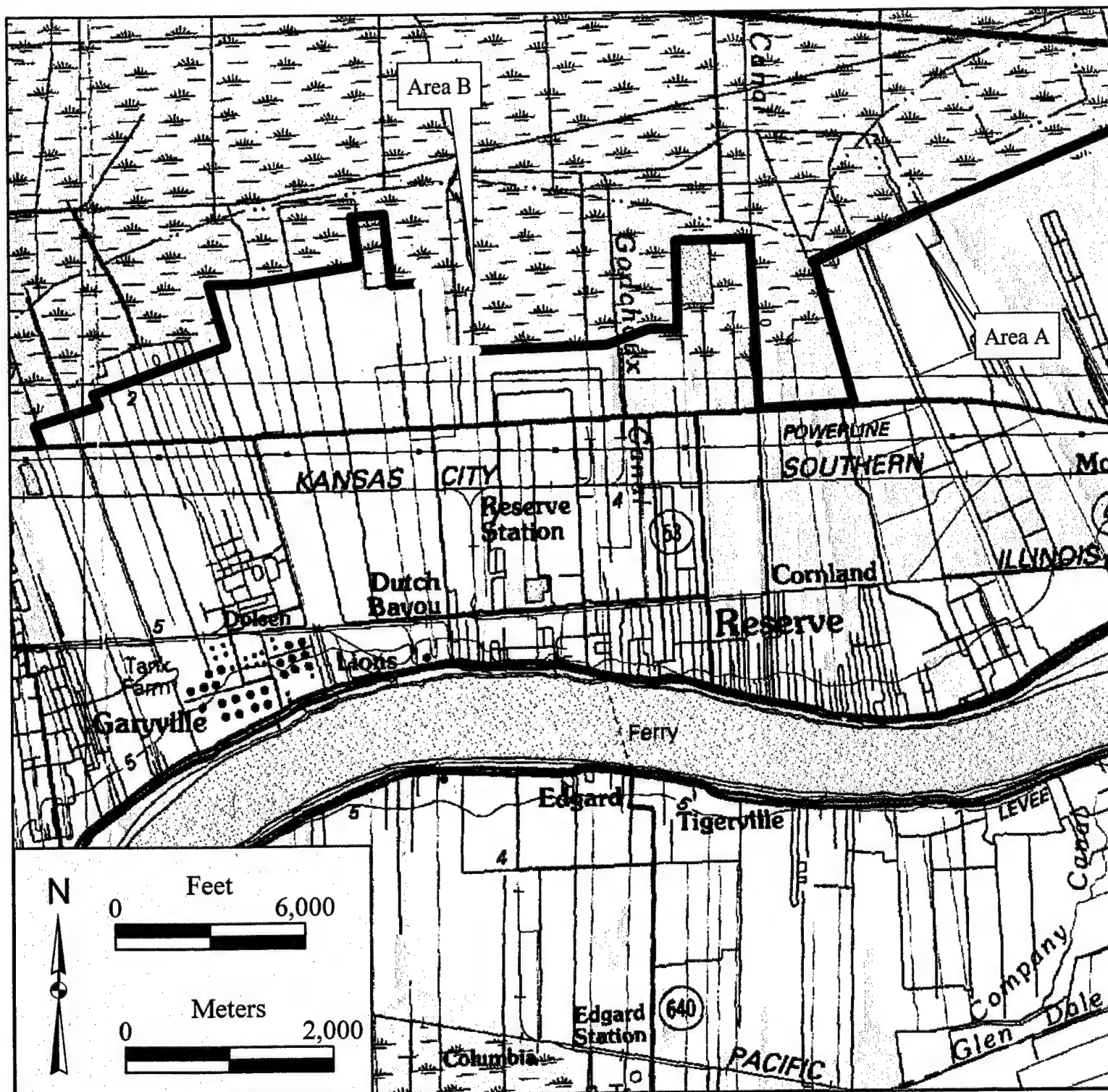
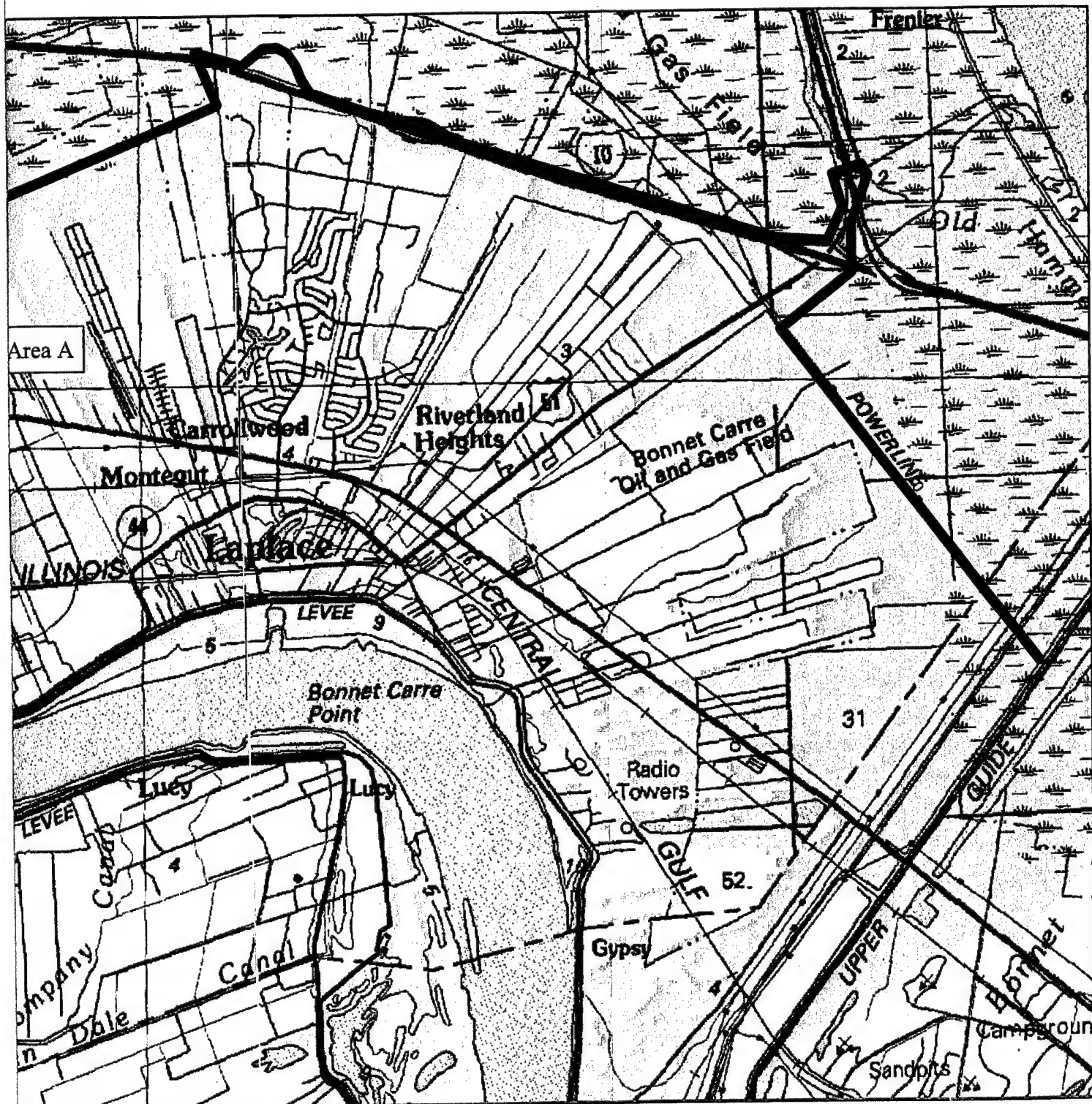


Figure 25. Excerpt from the Pontchatrain USGS 1:100,000 quadrangle showing Survey Areas A and B.



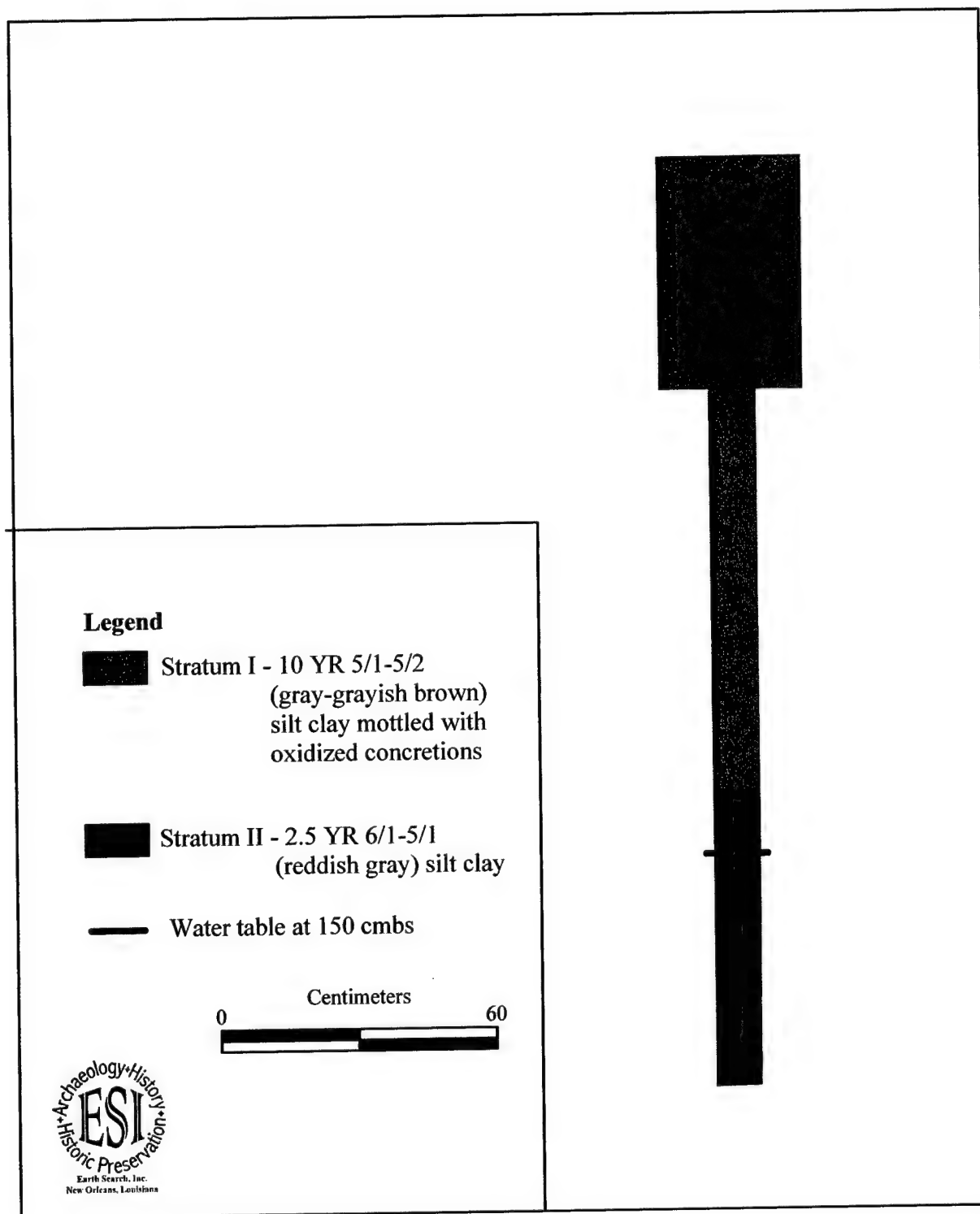


Figure 26. Typical soil profile from Areas A and B.



Figure 27. Photograph of Fairbanks Morse diesel engine.

No intact archaeological deposits were encountered in the vicinity of the engine. The engine and associated foundations were photo-documented. The engine would have operated a pump used in drainage of agricultural fields (see Chapter 4 for a discussion of sugarcane agriculture). The engine is an isolated feature that cannot contribute additional historic information. This feature is not eligible or potentially eligible for nomination to the NRHP.

CHAPTER 7 RECOMMENDATIONS

ESI performed an intensive cultural resources survey of approximately 2.9 km (1.8 mi) of the Lake Pontchartrain West Shore Hurricane Protection Project proposed levee ROW. A large Fairbanks Morse diesel engine (ca. 1920) was photo-documented. The engine is not eligible or potentially eligible for nomination to the NRHP. No additional cultural resources were recorded within the survey area, and no historic properties will be affected by the proposed construction. ESI recommends that no further archaeological investigations are warranted within the proposed levee footprint.

REFERENCES CITED

- Altschul, Jeffrey H.
1978 *The Houma-Terrebonne Archaeological Project*. Report of Investigations 10, New World Research, Ft. Walton.
- American Sugar Cane League
1939 *Louisiana Sugar: A Story of Louisiana Sugar Cane*. New Orleans.
- Aten, Lawrence E.
1983 *Indians of the Upper Texas Coast*. Academic Press, New York.
- Autin, Whitney J., Scott F. Burns, Bobby J. Miller, Roger T. Saucier, and John I. Snead
1991 Quaternary Geology of the Lower Mississippi Valley. In *The Geology of North America, Quaternary Nonglacial Geology*, vol. K-2, edited by R.B. Morrison, pp. 547-582. Geological Society of America, Boulder.
- Ayres, Quincy C., and Daniel Scoates
1928 *Land Drainage and Reclamation*. McGraw-Hill Book Company, Inc., New York.
- Bahr, L.M. and J.J. Hebrard
1976 *Barataria Basin: Biological Characterization*. Center for Wetland Resources, Louisiana State University, Baton Rouge.
- Belmont, John S.
1984 The Troyville Concept and the Gold Mine Site. *Louisiana Archaeology* 9:65-98.
- Bense, Judith A.
1994 *Archaeology of the Southeastern United States: Paleoindian to World War I*. Academic Press, San Diego.
- Bitgood, Mark J.
1989 *The Baytown Period in the Upper Tensas Basin*. Bulletin No. 12, Lower Mississippi Survey, Peabody Museum, Harvard University, Cambridge.
- Blume, Helmut
1990 *The German Coast During the Colonial Era, 1722-1803*. Translated and edited by Ellen C. Merrill. The German-Acadian Coast Genealogical Society, Destrehan, Louisiana.
- Bouchereau, Alcee and Louis
1868-1917 *Statement of the Sugar and Rice Crops Made in Louisiana*. Pelican Steam Book and Job Printing, New Orleans.
- Brasseaux, Carl A.
1987 *The Founding of New Acadia*. Louisiana State University Press, Baton Rouge.
- Britsch, L.D. and J.B. Dunbar
1990 *Geomorphic Investigation of Davis Pond, Louisiana*. Geotechnical Report no. GL-90-12. U.S. Army Corps of Engineers Waterway Experiment Station, Vicksburg.

References Cited, Continued

- Brown, Clair A.
1945 *Louisiana Trees and Shrubs*. Bulletin No. 1, Louisiana Forestry Commission, Baton Rouge.
- Brown, Ian W.
1985 Plaquemine Architectural Patterns in the Natchez Bluffs and Surrounding Regions of the Lower Mississippi Valley. *Midcontinental Journal of Archaeology* 10:251-305.
- Butler, W.E.
1980 *Down Among the Sugar Cane*. Moran Publishing Co., Baton Rouge.
- Byrd, Kathleen M., and Robert W. Neuman
1978 Archaeological Data Relative to Prehistoric Subsistence in the Lower Mississippi Alluvial Valley. *Geoscience and Man* 19:9-21.
- Caldwell, Joseph R.
1964 Interaction Spheres in Prehistory. In *Hopewellian Studies*, edited by J.R. Caldwell and R. Hall, pp. 135-143. Scientific Papers 12, Illinois State Museum, Springfield.
- Calhoun, Milburn (Editor)
1995 *Louisiana Almanac*, Pelican Publishing Company, Gretna.
- Castille, George J.
1987 *Cultural Resources Survey of the Landmark Land Corporation Reserve Swamp Area*. Submitted to the Division of Archaeology, Baton Rouge.
- Champomier, P.A.
1844-1862 *Statement of the Sugar Crop Made in Louisiana*. Cook, Young, and Company, New Orleans.
- Cockerham, Warren L., Ray E. Dance, Almond G. White, and Bradley E. Spicer
1973 *Soil Survey of St. James and St. John the Baptist Parishes, Louisiana*. United States Department of Agriculture, Soil Conservation Service, New Orleans.
- Coleman, James M.
1966 Ecological Changes in a Massive Fresh-Water Clay Sequence. *Transactions of the Gulf Coast Association of Geological Societies* 16:159-174.
- Crandall, Charles L. and Fred Barnes
1913 *Railroad Construction*. McGraw-Hill Book Co., New York.
- Department of Conservation
1933 *Fishes and Fishing in Louisiana*. Bulletin No. 23, State of Louisiana Department of Conservation, New Orleans.
- Duhe, Brian J.
1977 Preliminary Evidence of Seasonal Fishing Activity at Bayou Jasmine. *Louisiana Archaeology* 3:33-74.

References Cited, Continued

- Durbin, Gilbert J.
 - 1980 Changes in the Louisiana Sugar Industry in the Nineteen Thirties, Forties, and Fifties. In *Green Fields: Two Hundred Years of Louisiana Sugar*. The Center for Louisiana Studies, University of Southwestern Louisiana, Lafayette.
- Etcheverry, Bernard A.
 - 1931 *Land Drainage and Flood Protection*. McGraw-Hill Book Company, Inc., New York.
- Eyraud, Jean M. and Donald Millet (Compilers and Editors)
 - 1939 *A History of St. John the Baptist Parish*. Hope Haven Press, Marrero, Louisiana.
- Farrell, Kathleen M.
 - 1989 *Stratigraphy and Sedimentology of Holocene Overbank Deposits of the Mississippi River, False River Region, Louisiana*. Unpublished Ph.D. dissertation, Department of Geology and Geophysics, Louisiana State University, Baton Rouge.
- Fisk, Harold N.
 - 1944 *Geological Investigations of the Alluvial Valley of the Lower Mississippi River*. Mississippi River Commission, Vicksburg.
 - 1947 *Fine-Grained Alluvial Deposits and their Effects on Mississippi River Activity*. U.S. Army Corps of Engineers, Mississippi River Commission, Vicksburg.
- Flores, Romero M., Frank G. Ethridge, Andrew D. Miall, William E. Galloway, and Thomas D. Fouch
 - 1985 *Recognition of Fluvial Systems and Their Resource Potential*. SEPM Short Course No. 19. Society for Sedimentary Geology, Tulsa, Oklahoma.
- Ford, James A.
 - 1951 *Greenhouse: A Troyville-Coles Creek Period Site in Avoyelles Parish, Louisiana*. Anthropological Papers Vol. 44, Pt. 1, American Museum of Natural History, New York.
- Ford, James A., and George I. Quimby, Jr.
 - 1945 *The Tchefuncte Culture: An Early Occupation of the Lower Mississippi Valley*. Memoir 2, Society for American Archaeology, Salt Lake City.
- Ford, James A. and Clarence H. Webb
 - 1956 *Poverty Point, A Late Archaic Site in Louisiana*. Anthropological Papers Vol. 46, Pt. 1, American Museum of Natural History, New York.
- Fortier, Alcee
 - 1914 *Louisiana*. Vol. 1. Century Historical Association, New Orleans.
- Fowke, Gerard
 - 1927 Archaeological Work in Louisiana. *Smithsonian Miscellaneous Collections* 78(7):254-259.
 - 1928 *Archaeological Investigations II*. Forty-fourth Annual Report, pp. 405-540, Bureau of American Ethnology, Washington D.C.

References Cited, Continued

- Franks, Herschel A., Jill-Karen Yakubik, Jeffery E. Treffinger, R. Christopher Goodwin, and Paul C. Armstrong.
1986 *Cultural Resources Inventory of the Montz Freshwater Diversion Project Corridor, St. Charles Parish, Louisiana, Volumes I and II*. Submitted to the New Orleans District, U.S. Army Corps of Engineers, New Orleans.
- Frazier, D. E.
1967 Recent Deltaic Deposits of the Mississippi River: Their Development and Chronology. *Transactions-Gulf Coast Association of Geological Societies* 17:287-311.
- Fuller, Richard S. and Diane S. Fuller
1993 *Excavations at Morgan: A Coles Creek Period Mound Complex in Coastal Louisiana*. Bulletin 11, Lower Mississippi Survey, Peabody Museum, Harvard University, Cambridge.
- Fuller, Richard S., Jr., and David B. Kelley
1987 *Archaeological Survey and Testing Within Items 4-A and 4-B of the Sicily Island Levee Project, Catahoula Parish, Louisiana*. Submitted to the Vicksburg District, U.S. Army Corps of Engineers, New Orleans.
- Gagliano, Sherwood M. and Roger T. Saucier
1963 Poverty Point Sites in Southeastern Louisiana. *American Antiquity* 28:320-327.
- Galloway, William E., and David K. Hobday
1983 *Terrigenous Clastic Depositional Systems*. Springer-Verlag, New York.
- Gibson, Jon L.
1970 Archaeological Checklist of Edible Flora in the Lower Mississippi Valley. In *The Poverty Point Culture*, edited by B.J. Broyles and C.H. Webb, pp. 90-98. Bulletin No. 12, Southeastern Archaeological Conference, Morgantown, West Virginia.

1977 *Archaeological Survey of Portions of Little River, Boeuf River, and Big Creek, East Central and Northwest Louisiana*. Center for Archaeological Studies, University of Southwestern Louisiana, Lafayette.

1978 *Archaeological Survey of the Lower Atchafalaya Region, South Central Louisiana*. Report No. 5, Center for Archaeological Studies, University of Southwestern Louisiana, Lafayette.

1983 *Poverty Point*. Anthropological Study No. 7, Louisiana Archaeology Survey and Antiquities Commission, Baton Rouge.

1990 Earth Sitting: Architectural Masses at Poverty Point, Northeastern Louisiana. *Louisiana Archaeology* 13:20-238.
- Gilmore, A.B. (Editor)
1945 *The Louisiana Sugar Manual*. Queen and Crescent Building, New Orleans, LA.
- Goad, E.F.
1942 *American Diesel Engines: Their Operation and Repair*. Harper and Brothers, New York.
- Goins, Charles R. and John M. Caldwell
1995 *Historical Atlas of Louisiana*. University of Oklahoma Press, Norman.

References Cited, Continued

- Griffin, James B.
1967 Eastern North American Archaeology: A Summary. *Science* 156(3722):175-191.
- Heartfield, Lorraine, Dennis Price, and Glen Greene
1985 *A Cultural Resources Inventory of the Pearl River Basin, Louisiana and Mississippi*. Submitted to the Division of Archaeology, Baton Rouge.
- Hudson, Charles
1976 *The Southeastern Indians*. University of Tennessee Press, Knoxville.
- Ives, Clarence Albert
1964 *As I Remember*. Bureau of Educational Materials and Research, College of Education, Louisiana State University and Agricultural and Mechanical College, 1964.
- Jackson, H. Edwin
1982 Recent Research on Poverty Point Period Subsistence and Settlement Systems; Test Excavations at the J.W. Copes Sites in Northeast Louisiana. *Louisiana Archaeology* 8:75-88.

1989 Poverty Point Adaptive Systems in the Lower Mississippi Valley: Subsistence Remains from the J.W. Copes Site. *North American Archaeologist* 10(3):173-204.
- Jenkins Ned J. and Richard A. Krause
1986 *The Tombigbee Watershed in Southeastern Prehistory*. University of Alabama Press, Tuscaloosa.
- Jeter, Marvin D. and G. Ishmael Williams, Jr.
1989 Late Prehistoric Cultures, A.D. 1000-1500. In *Archaeology and Bioarchaeology of the Lower Mississippi Valley and Trans-Mississippi South in Arkansas and Louisiana*, edited by M.D. Jeter, J.C. Rose, G.I. Williams, Jr. and A.M. Harmon. Research Series 37, pp. 179-220, Arkansas Archaeological Survey, Fayetteville.
- Kelley, David B.
1992 Coles Creek Period Faunal Exploitation in the Oachita River Valley of Southern Arkansas. *Midcontinental Journal of Archaeology* 17(2):227-264.
- Kidder, Tristram R.
1992 Timing and Consequences of the Introduction of Maize Agriculture in the Lower Mississippi Valley. *North American Archaeologist* 13:15-41.

1993 *Archaeological Test Excavations in Tensas Parish, Louisiana*. Archaeological Report 2, Center for Archaeology, Tulane University, New Orleans.
- Kidder, Tristram R. and Gayle J. Fritz
1993 Subsistence and social change in the Lower Mississippi Valley: Excavations at the Reno Brake and Osceola Sites, Louisiana. *Journal of Field Archaeology* 20:281-297.

References Cited, Continued

- Klippart, John H.
1867 *The Principles and Practice of Land Drainage*. Robert Clarke & Co., Cincinnati.
- Kolb, Charles R. and Jack R. van Lopik
1958 *Geology of the Mississippi River Deltaic Plain, Southeastern Louisiana*. Technical Report No. 3-483, U.S. Army Engineer Waterways Experiment Station, Vicksburg.
- Krinitzsky, E.L. and F.L. Smith
1969 *Geology of Backswamp Deposits in the Atchafalaya Basin, Louisiana*. Technical Report S-69-8, U.S. Army Engineers Waterways Experiment Station, Vicksburg.
- Laurent, Lubin F.
1923 *A History of St. John the Baptist Parish*. Louisiana State University, Baton Rouge.
- Lee, Aubra. L., James. M. Lawton, Benjamin D. Maygarden and Jill-Karen Yakubik.
2000 *Phase 1 Terrestrial Archaeological Survey of the Proposed Entergy Little Gypsy to Madisonville Project Area, St. Charles, Tangipahoa, and St. Tammany Parishes, Louisiana*. Submitted to the Division of Archaeology, Baton Rouge.
- Louisiana Department of Agriculture and Immigration(LA Dept. of Agriculture)
1926, 1927 *Louisiana: Her Agricultural Resources, Her Industrial Developments, Her Opportunities*. The Louisiana Department of Agriculture and Immigration, Baton Rouge.
- Louisiana Department of Commerce and Industry
1937 *Louisiana's Resources and Purchasing Power*. Rex Laney, editor. Baton Rouge.
- Louisiana Historical Bureau (LA Historical Bureau)
1940 *The Historical Encyclopedia of Louisiana*. The Louisiana Historical Bureau, New Orleans.
- Maier, E.A.
1952 *A Story of Sugar Cane Machinery*. Sugar Journal, New Orleans.
- Maygarden, Benjamin, Jill-Karen Yakubik, Herschel A. Franks, Maria Tavaszi, Duncan Spencer, Colin Brooker, Donna K. Stone, Catheren Jones, Rosalinda Méndez, and Tara Bond
1994 *Archaeological Data Recovery at Ashland-Belle Helene Plantation (16AN26), Ascension Parish, Louisiana, Volume III: Investigations at the Sugar House*. Submitted to the Division of Archaeology, Baton Rouge.
- Maygarden, Benjamin, Jill-Karen Yakubik, Ellen Weiss, Chester Peyronnin, and Kenneth R. Jones
1999 *National Register Evaluation of New Orleans Drainage System, Orleans Parish, Louisiana*. Submitted to the New Orleans District, U.S. Army Corps of Engineers, New Orleans.
- Maygarden, Benjamin D.
2001 *The Sugar Cane Plantations of Louisiana: An Overview*. In Lee, Aubra, et al. *Archaeological Data Recovery, North Bend Plantation, 16SMY66 and 16SMY132, St. Mary Parish, Louisiana*. Draft report in preperation to be submitted to the New Orleans District, U.S. Army Corps of Engineers, New Orleans.

References Cited, Continued

- McCulloh, M.C., P.V. Heinrich, and J.I. Snead
1997 *Pontchatoula, Louisiana 30 x 60 Minute Quadrangle*. Geologic map, 1:100,000. Louisiana Geological Survey, Baton Rouge.
- McDaniel, Donald.
1987 *Soil Survey of St. Charles Parish, Louisiana*. United States Department of Agriculture, Soil Conservation Service, New Orleans.
- McIntire, William. G.
1979a *Cultural Resources Survey Shell Pipeline Corporation's Proposed Norco to Dupont 4" Butadeine Pipeline*. Submitted to the Division of Archaeology, Baton Rouge.

1979b *Cultural Resources Survey Shell Pipeline Corporation's Proposed Norco to Marathon 24" Pipeline*. Submitted to the Division of Archaeology, Baton Rouge.
- Menn, Joseph K.
1964 *The Large Slaveholders Of Louisiana: 1860*. Pelican Publishing Co., New Orleans.
- Moore, William E. and Roger G. Moore
1992 *A Cultural Resources Survey of the Phase IV Baton Rouge to New Orleans Replacement Project, St. James and St. John the Baptist Parishes, LA*. Submitted to the Division of Archaeology, Baton Rouge.
- Morehouse, A.D.
1910 *Reclamation of the Southern Louisiana Wet Prairie Lands*. Office of Experiment Stations, U.S. Department of Agriculture. Government Printing Office, Washington, D.C.
- Morrison, Lacey H.
1939 *American Diesel Engines*. McGraw-Hill Book Co., New York.
- Murphy, Kenneth E., B. Arville Touchet, Almond G. White, Jerry J. Daigle, and Henry L. Clark
1977 *Soil Survey of St. Martin Parish, Louisiana*. United States Department of Agriculture, Soil Conservation Service, New Orleans.
- Nassaney, Michael S. and Charles Cobb (editors)
1991 *Stability, Transformation, and Variation: The Late Woodland Southeast*. Plenum Press, New York.
- Neuman, Robert W.
1969 Current Research in Louisiana. *SEAC Newsletter* 13:13-15.

1984 *An Introduction to Louisiana Archaeology*. Louisiana State University Press, Baton Rouge.
- Phillips, Phillip
1970 *Archaeological Survey in the Lower Yazoo Basin, Mississippi, 1947-1955*. Papers of the Peabody Museum of Archaeology and Ethnology 60, Harvard University, Cambridge.

References Cited, Continued

- Pickels, George W.
1925 *Drainage and Flood-Control Engineering*. McGraw-Hill Book Company, Inc., New York.
- Poplin, Eric C., Paul C. Armstrong, Carol J. Poplin, and R. Christopher Goodwin
1988 *Phase 2 of the Cultural Resources Inventory of the Bonnet Carre Spillway, St. Charles Parish, Louisiana*. Submitted to the New Orleans District, U.S. Army Corps of Engineers, New Orleans.
- Powers, W.L., and T.A.H. Teeter
1932 *Land Drainage*. John Wiley & Sons, Inc., New York.
- Price, G.R. Denis
1987 *A Cultural Resources Survey of a Proposed 24-inch Diameter United Gas Pipe Line Company Pipeline in Ascension, St. James, and St. John the Baptist Parishes, Louisiana*. Submitted to the Division of Archaeology, Baton Rouge.
- Quaintance, H.W.
1904 *The Influence of Farm Machinery on Production and Labor*. The MacMillan Co., New York.
- Quimby, George I., Jr.
1951 *The Medora Site, West Baton Rouge Parish, Louisiana*. Anthropological Series 24(2), Field Museum of Natural History, Baton Rouge.
- Rivet, Philip G.
1974 *I-10 Interchange Eden Isles Development*. Submitted to the Division of Archaeology, Baton Rouge.

1975 *Archaeological Survey of Belle Terre Drive Extension Route LA 3188, St. John the Baptist Parish, Louisiana*. Submitted to the Division of Archaeology, Baton Rouge.
- Robblee, Pat, Roger T. Saucier, Susan B. Smith, Dave Davis and William Athens
1998 *Phase I Cultural Resources Survey and Inventory of a 78.0 km (48.5 mi) segment of the proposed 159.0 km (98.9 mi) Koch Pipeline Southeast, Inc., Pascagoula Pipeline Project, Assumption, St. James, St. John the Baptist, St. Charles and St. Tammany Parishes, Louisiana*. Submitted to the Division of Archaeology, Baton Rouge.
- Rogers, William
1905 *Pumps And Hydraulics*. Two volumes. The Theo. Audel Co., New York.
- Russell and Erwin Manufacturing Company
1980 *Illustrated Catalogue of American Hardware*. The Association for Preservation Technology, Baltimore, Maryland.
- Russell, R.J.
1936 *Physiography of the Lower Mississippi River Delta*. In *Lower Mississippi Delta, Reports on the Geology of Plaquemines and St. Bernard Parishes*, Department of Conservation. *Louisiana Geological Survey Bulletin* 8:pp.3-199.

References Cited, Continued

- Saucier, Roger T.
 1974 *Quaternary Geology of the Lower Mississippi Valley*. Research Series No. 6, Arkansas Archaeological Survey, Fayetteville.
- 1981 Current Thinking on Riverine Processes and Geologic History as Related to Human Settlement in the Southeast. *Geoscience and Man* 22:7-18.
- 1994 *Geomorphology and Quaternary Geologic History of the Lower Mississippi Valley*, Volumes I and II. U.S. Army Engineer Waterways Experiment Station, Vicksburg.
- Saucier, Roger T., and Lawson M. Smith
 1986 Late Wisconsinan and Holocene Evolution of the Lower Mississippi Valley. *Geological Society of America Abstracts with Program* 18:739.
- Schmitz, Mark
 1979 The Transformation of the Southern Sugar Cane Sector: 1860-1930. *Agricultural History* 53(1):270-285.
- Schumm, Stanley A., and G.R. Brakenridge
 1987 Chapter 10 River Responses. In *North America and Adjacent Oceans During the Last Deglaciation*, edited by W.F. Ruddiman and H.E. Wright, pp. 221-240, *The Geology of North America*, vol. K-3, Geological Society of America, Boulder, Colorado.
- Shenkel, J. Richard
 1978 *Cultural Resources Survey of the St. John Parish Airport*. Submitted to the Division of Archaeology, Baton Rouge, LA.
- 1981 *Oak Island Archaeology: Prehistoric Estuarine Adaptations in the Mississippi River Delta*. Submitted to the National Park Service, Jean Lafitte National Historical Park and Preserve, New Orleans.
- 1984 Early Woodland in Coastal Louisiana. In *Perspectives on Gulf Coast Prehistory*, edited by D.D. Davis, pp.41-71. University of Florida Press, Gainesville.
- Shenkel, J. Richard and Jon L. Gibson
 1974 Big Oak Island: An Historical Perspective of Changing Site Function. *Louisiana Studies* 8:173-186.
- Steponaitis, Vincas P.
 1986 Prehistoric Archaeology in the Southeastern United States, 1970-1985. *Annual Review of Anthropology* 15:363-404.
- St. John the Baptist Development Board
 1955 *St. John the Baptist Parish Resources and Facilities*, State of Louisiana Department of Public Works Planning Division, Louisiana.
- Styles, Bonnie Whatley
 1981 *Faunal Exploitation and Resource Selection Early Late Woodland Subsistence in the Lower Illinois Valley*. Northwestern University Archaeological Program, Evanston, IL.

References Cited, Continued

- Toth, Alan
1988 *Early Marksville Phases in the Lower Mississippi Valley: A Study of Culture Contact Dynamics*. Archaeological Report 21, Mississippi Department of Archives and History, Jackson.
- Von Bongart, B.J., Paul H. Wilkinson, and Rex W. Wadman
1938 *Diesel Engine Catalog*, v. III. Diesel Engines, Inc., New York.
- Walthall, John A.
1980 *Prehistoric Indians of the Southeast: Archaeology of Alabama and the Middle South*. University of Alabama Press, Tuscaloosa, AL.
- Webb, Clarence H.
1982 The Poverty Point Culture. *Geoscience and Man* 17.
- Weinstein, Richard A.
1986 Tchefuncte Occupation of the Lower Mississippi Delta and Adjacent Coastal Zone. In *The Tchula Period in the Mid-South and Lower Mississippi Valley*, edited by D.H. Dye and R.C. Brister, pp.102-127. Archaeological Report 17, Mississippi Department of Archives and History, Jackson.
- Weinstein, Richard A. and David B. Kelley
1992 *Cultural Resources Investigation in Terrebonne Marsh, South-Central Louisiana*. Submitted to the New Orleans District, U.S. Army Corps of Engineers, New Orleans.
- Weinstein, Richard A., and Philip G. Rivet
1978 *Beau Mire: A Late Tchula Period Site of the Tchefuncte Culture, Ascension Parish, Louisiana*. Anthropological Report No. 1, Louisiana Archaeological Survey and Antiquities Commission, Baton Rouge.
- White, David A., Stephen P. Darwin, and Leonard B. Thien
1983 Plants and Plant Communities of Jean Lafitte National Park, Louisiana. *Tulane Studies in Zoology and Botany* 24(2):101-129.
- Wilkinson, Joseph B., Jr.
1890 *Report on Diffusion and Mill Work in the Louisiana Sugar Harvest of 1889-1890*. Brandao & Gill, New Orleans.
- Williams, Stephen and Jeffrey P. Brain
1983 *Excavations at the Lake George Site, Yazoo County, Mississippi, 1958-1960*. Papers of the Peabody Museum 70, Harvard University, Cambridge.
- Woodiel, Deborah K.
1980 St. Gabriel: Prehistoric Life on the Mississippi. Unpublished masters' thesis, Department of Geography and Anthropology, Louisiana State University, Baton Rouge.

1993 The St. Gabriel: Prehistoric Life on the Mississippi. *Louisiana Archaeology* 20:1-136.
- Work Projects Administration (WPA)
1941 *Louisiana: A Guide to the State*. Hastings House Publishers, New York.

References Cited, Continued

Yakubik, Jill Karen, Aubra Lee, Benjamin Maygarden, and Pauline Barrow

1998 *Phase I Survey for the Proposed Meridian Aggregates Company Sand and Gravel Mine St. Helena Parish, Louisiana*. Submitted to Forte and Tablada, Inc., Baton Rouge.